

RAILROAD GAZETTE

QUARTO VOL. IX.—NO. 8.
TWENTIETH YEAR.

A Journal of Transportation, Engineering and Railroad News.

\$4.50 PER ANNUM,
POSTAGE FREE.

NEW YORK: 73 Broadway.

FRIDAY, FEBRUARY 23, 1877.

CHICAGO: 77 Jackson St.

GEORGE A. EVANS,
Bethlehem Steel Rails,
74 WALL STREET, N. Y.

WM. J. NICOLLS, Civil Engineer,
Manufacturers' Agent and Broker,
5 POST OFFICE AVENUE, BALTIMORE, MD.,
Railroad Supplies a Specialty.

"LOUGHRIDGE AIR BRAKE,"
Adopted by the Balt. & Ohio, W. Md. C. & P.,
(with Mountain grades of 182 feet to the mile), St. L.,
L. & W. in Kansas and others. It has been used on
a thousand or more cars long enough to convince
the most incredulous that it is the best. The best
stop yet accomplished in the world with air brakes
was made with this practical invention on the B. &
Ohio R. R. The train weighed 250 tons and con-
sisted of ten cars, speed 42-60 miles per hour;
time in stopping, 16 seconds; distance run, 587 ft. 12
in. It is capable of much better results now.
Cheap in construction and repair, of but few and
simple parts, uniform and reliable in action, quick
to apply and relieve the brakes, and accomplishes
all desirable ends required in running trains that
compete for speed. For further information ad-
dress, WILLIAM LOUGHRIDGE, P. O. Box 441,
Office Morse Building, Room 17, Baltimore, Md.

JOHN A. WILSON, FRED. G. THORN,
Civil Engineer, Jos. M. Wilson, Architect.
Civil Engineer and Architect.

WILSON BROTHERS & CO.,
Civil Engineers and Architects.
410 Walnut St. Philadelphia, Pa.
Surveys and estimates made for railway lines.
Plans, specifications and estimates furnished for
roads, bridges, stations, machine shops, engine
houses, hotels, dwellings and all engineering and
architectural structures. Construction of engineering
and architectural works attended to.

CLEMENS HERSCHEL, Civ. Eng.
IRON AND OTHER BRIDGES AND
ROOFS A SPECIALTY.
No. 66 State street, Boston, Mass.
Mr. Herschel will refer, if desired, to finished
bridges or roofs designed by him or built under his
superintendency; to his services as a Bridge Com-
missioner; to his book on "Continuous Revolving
Draw-Bridges." Can also give many and eminent
personal references.

THE SAFE DEPOSIT CO.
OF NEW YORK.
140, 142 and 146 Broadway.
FRANCIS H. JENKS, President.
The First Established in the World.
For the safe-keeping of Valuables, Bonds, Stocks,
Plate, Jewelry, Wills, etc., (at \$1 a year for \$1,000
and the renting of Safes (at from \$15 to \$200
a year), in its fire and burglar proof vaults.
ROOMS FOR LADIES.
with every convenience, separate desks, etc., are
provided.

RAILROAD GAZETTE DIRECTORY.

[This index to the advertisements in the RAIL-
ROAD GAZETTE is published in order that those
who make use of them as a directory of railroad
supplies and equipment. A number of adver-
tisements appear only "every other week" or
"once a month," in such cases, where the adver-
tisement is not in the current number, a blank
appears instead of the folio opposite the name.]

Accountants:	Gilman & Steele, 20 Nassau street, N. Y.	i
Air Brakes:	Wm. Loughridge, Baltimore.	i
	Westinghouse Air-Brake Co., Pittsburgh.	i
Axles:	A. & P. Roberts & Co., Philadelphia.	v
	Wilson Walker & Co., Pittsburgh.	ii
Boiler Patches:	J. P. Richards, Providence, R. I.	xii
Bolts, Nuts, Boiler Rivets, etc.:	Hoppe & Townsend, Philadelphia.	vii
Bridges:	American Bridge Co., Chicago.	iv
	Baltimore Bridge Co., Baltimore.	iv
	Cincinnati Bridge Co., Cincinnati.	iv
	Clark, Reeves & Co., Philadelphia.	iv
	J. R. Coltrane & Co., Philadelphia.	iv
	Bellevue Bridge Co., 31 Wall street, N. Y.	iv
	Detroit Bridge & Iron Works, Detroit.	iv
	Edgemoor Iron Co., Wilm. & 79 Liberty st., N. Y.	iv
	O. W. James & Co., Milwaukee, Wis.	iv
	Rail & Marine, Athens, Ga.	iv
	Rose Iron Bridge & Manufacturing Co., Cleveland.	iv
	Raymond Bridge Company, Philadelphia.	iv
	Leighton Bridge & Iron Works, Rochester.	iv
	Lowthorp & Henderson, Trenton, N. J.	iv
	Louisville Bridge & Iron Co., Louisville.	iv
	Nagara Bridge Works, Buffalo.	iv
	Wrought-Iron Bridge Co., Canton, O.	iv
Bridge Bolts:	Hotchkiss & Gaylord, Cleveland.	iv
Cars:	Barney & Smith, Manufacturing Co., Dayton, O.	x
	J. G. Brill & Sons, Philadelphia.	x
	Hagan & Hollingsworth Co., Wilmington.	x
	J. M. Jones & Co., West Troy.	x
	Carriage Car & Mfg. Co.	x
Car Heaters and Stoves:	Baker, Smith & Co., New York.	vii
Car Wheels:	Baltimore Car-Wheel Co., Baltimore.	iii
	Barum & Richardson Co., Lima, Pa.	iii
	Barum & Richardson Manufacturing Co., Chicago.	iii
	Bowling, Maher & Brayton, Cleveland.	iii
	Capitol Wheel & Foundry Co., Waverly, N. Y.	iii
	Ensign Manufacturing Co., Huntington, West Va.	iii
	John L. Gill, Columbus, O.	iii

WESTINGHOUSE AIR-BRAKE COMPANY,
PITTSBURGH, PA., U. S. A.,
Manufacturers of the

WESTINGHOUSE AUTOMATIC BRAKE.
WESTINGHOUSE LOCOMOTIVE DRIVER BRAKE.
VACUUM BRAKES (Westinghouse & Smith Patents).
WESTINGHOUSE AIR BRAKE.
Particular attention is called to the "AUTOMATIC" and "LOCOMOTIVE DRIVER BRAKES," now being
tested and adopted by the prominent lines.
With the "DRIVER BRAKE" the engineer can handle an ordinary freight train better than with brakes.
The saving in car wheels and wages will therefore be apparent. On shifting or yard engines it is invaluable.
The "AUTOMATIC" has proved itself to be the most efficient train and safety brake known. Its application is
instantaneous; it can be operated from any car in the train, if desired, and should the train separate, or a hose or
pipe fail, it applies automatically. A GUARANTEE is given customers against LOSS FROM PATENT SUITS on the
apparatus sold them.
FULL INFORMATION FURNISHED ON APPLICATION.

**WILL APPEAR PROMPTLY UPON CON-
CLUSION OF SITTINGS OF JURY.**
OFFICIAL.
A COMPLETE REPORT OF THE TESTIMONY TAKEN BY A
CORONER'S JURY, CONVENED DEC. 31, 1876, AT
ASHTABULA, OHIO,
in the case arising out of the failure of the
RAILWAY BRIDGE
at that place, Dec. 29, 1876.

Printed, by authority, from the notes of the sworn
stenographer to the Coroner and Jury; with maps of
the railway station grounds, and of the village of
Ashtabula; and several views and drawings, showing
the wrecked bridge, generally and in detail, and
illustrating the statements of experts, witnesses
before the Jury.
Royal octavo, about 450 pp.; with plates.
Edited by J. M. GOODWIN, C. E., Mem. Am. Soc.
C. E., Railway Expert and Associate Counsel to the
Jury, to whom orders may be sent, at Cleveland,
Ohio.
Price, \$3.00.
Cleveland: Robison, Savage & Co., 1877.

**OFFICE OF THE
UNITED STATES ROLLING
STOCK CO.,**
Nos. 74 and 76 Wall Street,
New York, Feb. 19, 1877.
The dividend of ten shillings, sterling, per share,
declared at the meeting of shareholders of 5th Inst.,
is payable on and after the 1st day of March next.
By order,
A. HEGEWISCH,
Treasurer.

Reliable, Cheap and Entertaining.
Contains useful information on
ALL SCIENTIFIC SUBJECTS.
THE "ENGINEERING NEWS"
Appeals to Engineers, Architects,
Contractors and Scientific Men.
Samples mailed gratis on application.
JOHN WILEY & SONS,
15 Astor place, New York City.

100 LOCOMOTIVES,
of the best makers, nearly new, 30 tons, 16x24,
TO LEASE,
on temporary or permanent leases, at low rates, by
THE UNITED STATES ROLLING STOCK CO., 76 Wall Street, New York.
A. HEGEWISCH, Treasurer and Secretary.

**RAILWAY ECONOMY
And Security.**

**Hall's Automatic Electric Railway Signal
System.**
Best in the World.

THE HALL RAILWAY SIGNAL COMPANY.
THOMAS S. HALL, Gen'l Manager,
West Meriden, Conn.

W. CALHOUN, E. G. STEELE,

ACCOUNTANTS & AUDITORS,
No. 20 Nassau Street.
Complicated accounts of Estates and Partnerships
investigated and adjusted. Accounts prepared for
the Surrogate. Books of Public Companies, Firms,
etc., opened, written up or closed.
Special attention given to Railroad investigations
in any part of the United States or Canada.
REFERS BY PERMISSION TO:
Geo. H. Coo, Esq., Pres't American Exchange Bank.
W. A. Wheelock, Esq., Pres't Central Nat. Bank.
Jas. Lynch, Esq., Pres't Irish Emigrant Society.
Col. H. S. McComb, Pres't N. O. St. L. & C. R. R.
Ex. Norton, Esq., Pres't Paducah & Mem. R. R. Co.
Jos. F. Joy, Esq., Receiver Dutchess & Col. R. B.
Parker Handy, Esq., Banker.
H. W. Smithers, Esq., Agent.
Hon. H. A. Smythe, late Collector of Port of N. Y.
Hon. Jas. P. Silliman, Judge of the Marine Court.
Messrs. Van Winkle, Candler & Jay, Counselors.

RAILROAD IRON.
50 and 55 lbs. in store at New Orleans.
50 and 55 lbs. in store at New York.
Bessemer Steel Rails.
46, 56 and 60 lbs. in store at New York.
For sale by
DANA & COMPANY,
20 Nassau street.

J. S. KENNEDY & CO.,
BANKERS AND MERCHANTS,
41 CEDAR CORNER WILLIAM STREET,
New York.
Buy and sell Railroad Investment Securities, Col-
lect Coupons and Dividends, Negotiate Loans and
draw Bills of Exchange on London.
Agents of the

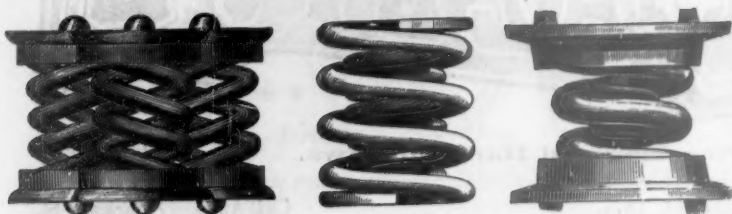
CAMBRIA IRON COMPANY,
of JOHNSTOWN, Pa., for the sale of their IRON and
STEEL RAILS.
All business relating to the Construction and
Equipment of Railroads undertaken.

Hamilton Steele-Wheel Co., Philadelphia.	ii	Nash Machine Co., Taunton, Mass.	ix
Lobloll Car-Wheel Co., Wilmington, Del.	ii	National Loco. Works, Connelville, Pa.	ix
Louisville Car-Wheel & Supply Co., Louisville.	ii	Pittsburgh Loco. & Car Works, Pittsburgh.	ix
McKee & Fuller, Catawissa, Pa.	iii	Porter, Bell & Co., Pittsburgh.	ix
Thomas May & Co., Indianapolis.	iii	Rogers Loco. & Machine Works, Paterson, N. J.	ix
Nowry Car & Wheel Co., Cincinnati.	iii	Schenck Loco. Works, Schenectady, N. Y.	ix
Ramapo Wheel & Foundry Co., Ramapo, N. Y.	iii	Taunton Loco. Mfg Co., Taunton, Mass.	ix
Taylor Iron Works, High Bridge, N. J.	iii		
A. Whitney & Sons, Philadelphia.	iii		
Checks:	vii	Locomotives to Lease:	i
John Robbins, Boston.	vii	U. S. Rolling Stock Co., 74 Wall st., N. Y.	i
Civil Engineers:	vii	Locomotive Balances:	i
Clemens Herschel, Boston.	vii	T. S. Morton, 65 Elizabeth st., N. Y.	i
W. J. Nicolls, Baltimore.	i	Lubricators:	i
Wilson Bros. & Co., Philadelphia.	i	C. H. Parshall, Detroit.	i
Cordage:	v	Machinists' Tools:	ii
Elizabethtown Steam Cordage Co., N. Y.	v	W. B. Bement & Son, Philadelphia.	ii
Cushioned Wheel Hammers:	x	Ferris & Miles, Philadelphia.	ii
Bradley Manufacturing Co., Syracuse.	x	E. Harrington & Son, Philadelphia.	ii
Drilling Machines:	x	Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y.	xii
Thorne, DeHaven & Co., Philadelphia.	x	Mortising Machines:	ii
Duplex Tickets:	vii	Lane & Bodley, Cincinnati.	ii
American Duplex Ticket Co., 360 Broadway, N. Y.	vii	Paints:	vii
Employment:	vii	Iron-Clad Paint Co., Cleveland, O.	vii
Zell, Davis & Co., Philadelphia.	xii	E. Maxwell & Co., St. Louis.	xii
Engineering Instruments:	xii	Princo's Metallic Paint Co., 229 Pearl st., N. Y.	xii
Buff & Berger, Boston.	xii	Rogers & Co., Fort Wayne.	xii
W. Kuebler, Philadelphia, Pa.	xii	Quick-Stop Train Brake:	i
James Prentice, 164 Broadway, N. Y.	xii	Wm. Loughridge, Baltimore.	i
W. J. Young & Sons, Philadelphia.	xii	Rails:	viii
Excavators:	ii	Albany & Henss, Iron & Steel Co., Troy, N. Y.	viii
S. B. Alger, Long Island City, N. Y.	ii	Cambria Iron Co., Johnstown, Pa.	viii
John Souther & Co., Boston.	ii	Cleve. Rolling Mill Co., Cleveland, O.	viii
Files:	x	Dana & Co., 20 Nassau st., N. Y.	viii
G. & H. Barnett, Philadelphia.	x	Edgar Thomson Steel Co., Pittsburgh.	viii
For Sale:	x	Geo. A. Evans, 74 Wall st., N. Y.	i
H. & H. Elliott, E. St. Louis, Ill.	x	North Chi. Rolling Mill Co., Chicago.	viii
Seamless Steel Ware & Frog Co., Harrisburg.	xii	Springfield Iron Co., Springfield, Ill.	viii
Hotels:	ii	Rail Fastenings:	v
The Brunswick, Boston.	ii	American Ry. Supply Co., Pittsburgh.	v
Richard Dudgeon, 24 Columbia st., N. Y.	vii	Atwood Con. Lock Nut Mfg Co., 40 Broadway, N. Y.	v
Phillip S. Justice, Philadelphia.	viii	Fisher & Norris, Trenton, N. J.	vii
McCoy & Co., 134 Duane st., N. Y.	x	Loomis Nut-Lock Washer Co., Cleveland.	v
Injectors:	x	Railroads and Transportation Lines:	x
National Tube Works Co., Boston.	x	Atlantic & Great Western.	x
Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y.	xii	Baltimore & Ohio.	x
Iron Work for Contractors:	v	Chicago & Alton.	xi
Edgemoor Iron Co., Wilm. & 79 Liberty st., N. Y.	v	Chicago, Milwaukee & St. Paul.	xi
Iron Buildings:	xii	Chicago & Northwestern.	xi
Schweizer & Gruwe, 71 Broadway, N. Y.	xii	Chicago, Rock Island & Pacific.	xi
Journal Bearings:	x	Cleveland, Col., Cinn. & Indianapolis.	xi
Geo. R. Menely & Co., West Troy, N. Y.	x	Empire Transportation Co.	x
C. J. A. Dick, Philadelphia.	viii	General Transatlantic Co.	x
Locomotives:	vi	Illinois Central.	xi
Baldern Locomotive Works, Philadelphia.	vi	Michigan Central.	xi
Brooks Locomotive Works, Dunkirk, N. Y.	vi	New York Central & Hudson River.	xi
Danforth Loco. & Mach. Co., Paterson, N. J.	ix	New York and New England.	x
Dickson Mfg. Co., Scranton, Pa.	ix	North Pennsylvania.	x
Hinkley Locomotive Works, Boston.	ix	Pennsylvania.	x
Manchester Loco. Works, Manchester, N. H.	ix	Philadelphia & Reading.	xi
		Philadelphia, Wilmington & Baltimore.	xi
		Union Pacific.	xi
		Wisconsin Central.	xi
		Railroad Land Companies:	xi
		A. N. Kellogg, Chicago.	xi

Railroad Manuals:	ix	Railroad Securities:	ix
H. Y. & H. W. Poor, 68 Broadway, N. Y.	ix	J. S. Kennedy & Co., 4 Cedar st., N. Y.	i
Railroad Car Brakes:	i	Railroad Car Brakes:	i
Wm. Loughridge, Baltimore.	i	Rubber Goods:	vi
Rubber Goods:	vi	Hamilton Rubber Co., Trenton, N. J.	vi
Safe Deposits:	i	Pottsville Manufacturing Co., Boston.	ii
Sash Chains:	i	Safe Deposits:	i
T. S. Morton, 65 Elizabeth st., N. Y.	i	Sash Chains:	i
Signals:	xii	Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y.	xii
Hall Ry. Signal Co., West Meriden, Ct.	xii	Spikes:	xii
Spikes:	xii	Dalworth, Porter & Co., Pittsburgh.	xii
Springs:	vi	Pottsville Spoke Works, Pottsville, Pa.	vi
Columbia Car Spring Co., 322 Seventh ave., N. Y.	ii	Tudor Iron Works, St. Louis & Chicago.	vi
Culmer Spring Co., Pittsburgh.	ii	Steel and Steel Tires:	ii
A. French & Co., Pittsburgh.	ii	Isaac Jenks & Sons, 134 Duane st., N. Y.	ii
Steel and Steel Tires:	ii	Midvale Steel Works, Nicetown, Philadelphia.	xii
Isaac Jenks & Sons, 134 Duane st., N. Y.	ii	Thomas Frosser & Son, 15 Gold st., N. Y.	v
Midvale Steel Works, Nicetown, Philadelphia.	xii	Standard Steel Works, Philadelphia.	vii
Randall & Jones, Boston.	v	Switches:	vii
Standard Steel Works, Philadelphia.	vii	Pennsylvania Steel Co., Harrisburg.	vii
Switches:	vii	Wharton R. R. Switch Co., Philadelphia.	v
Tanks:	v	Taps and Dies:	viii
Geo. L. Burkhardt, Philadelphia, Pa.	xii	H. S. Manning & Co., 113 Liberty st., N. Y.	viii
Taps and Dies:	viii	Turn Tables for Railways:	xii
Turn Tables for Railways:	xii	Wm. Sellers & Co., Phila. & 79 Liberty st., N. Y.	xii
Valves:	vii	Valves:	vii
Ludlow Valve Manufacturing Co., Troy, N. Y.	vii	Varnishes:	xii
Peet Valve Co., Boston.	vii	Berry Bros., Detroit.	xii
Varnishes:	xii	Watches:	xii
Watches:	xii	Giles, Bros. & Co.	xii
Welding Compound:	xii	Watchesman's Time Detectors:	xii
Schierloh Manufacturing Co., Jersey City.	xii	J. E. Buck, Boston.	xii
Wire Rope:	xii	Welding Compound:	xii
Wm. A. Roebling's Sons, Trenton, N. J.	xii	Schierloh Manufacturing Co., Jersey City.	xii
Wrenches:	xii	Wire Rope:	xii
A. G. Coo & Co., Worcester, Mass.	viii	Wrenches:	xii
L. Coo & Co., Worcester, Mass.	viii	Wanted and For Sale:	vii

CULMER SPRING CO.

MANUFACTURERS OF



RAILWAY CAR SPRINGS,

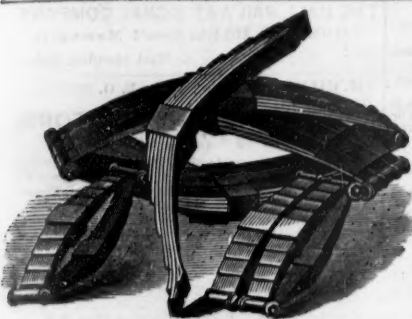
Spiral Buffer, Freight Bolster, Journal and Equalizing Bar Springs.

SPRINGS. OF ALL DESCRIPTIONS, A SPECIALTY.

OFFICE & WORKS, Cor. 26th and LIBERTY STS.

HENRY A. BREED,
General Manager and Treasurer.

PITTSBURGH, PA.



Copyright secured.

PITTSBURGH CAST-STEEL
SPRING WORKS.

A. FRENCH & CO.

MANUFACTURERS OF
Extra tempered light elliptic

CAST-STEEL SPRINGS,

FOR
RAILROAD CARS & LOCOMOTIVES,
From best Cast Steel.

Office and Works: Cor. Liberty and 21st
Streets, Pittsburgh, Pa.

ST. LOUIS BRANCH—M. M. BUCK & CO.
CHICAGO BRANCH—146 E. LAKE ST.



COLUMBIA
CAR SPRING CO.,

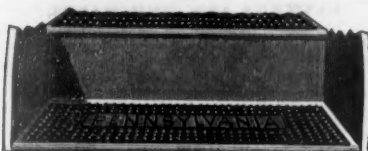
322 Seventh Ave., cor. 28th St.,
NEW YORK.

BRANCHES:

109 Milk St., Boston,

123 Central Ave., Cincinnati,

17 So. Canal St., Chicago.



Rubber Plates for Car Steps.

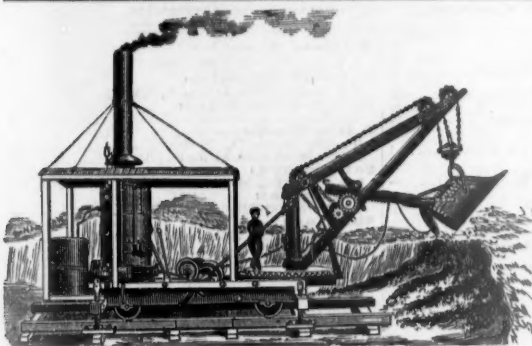
Accidents from slipping prevented—icy steps
avoided—the elasticity of the rubber breaks the
ice when stepped upon.

Our step and panel having the name of a rail-
road moulded thereon is very ornamental, and adds
much to the appearance of car steps.

MANUFACTURED BY

Rubber Step Manufac'g Co.,
43 Haverhill Street, Boston.

Send for circular.



ALGER'S
Patent Friction
EXCAVATORS
AND
DREDGES.

MANUFACTURED BY

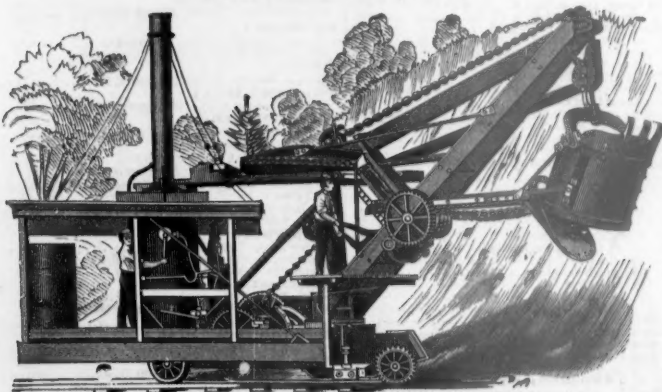
Vulcan Iron Works Co.,

Oswego, N. Y.,

AND

S. B. ALGER,
Long Island City,
N. Y.

JOHN SOUTHER & CO., Boston, Mass.,
Exclusive Manufacturers of the



Otis Patent Steam Excavators
WITH CHAPMAN'S IMPROVEMENTS, AND DREDGES.

THOMAS MAY & CO.,

MANUFACTURERS OF THE STANDARD

CAR AND LOCOMOTIVE WHEELS.

Spoke Engine Truck Wheels a Specialty.

Cor. Tenth and Sheldon Sts., INDIANAPOLIS, IND.

THE HAMILTON STEELED-WHEEL CO., OF PHILADELPHIA.

W. G. HAMILTON,
President.
WM. M. SPACKMAN,
Treasurer.
CHAPMAN BIDDLE,
Solicitor.



OFFICE.
68 NORTH SECOND STREET
Philadelphia, Pa.

24 BROADWAY
New York.

Grant Licenses to manufacture and use Car Wheels made under Patents of W. G. Hamilton and Geo. Whitney, adding largely to the strength of the metal, and rendering available the use of Non-Chilling Irons.

WHEELS AND AXLES
MADE OF THE BEST STOCK
AND IN THE MOST CAREFUL MANNER
FURNISHED SEPARATELY OR "FITTED" MAKING COMPLETE SETS

TAYLOR IRON WORKS
ON THE LINE OF THE CENTRAL R.R. OF NEW JERSEY
HIGH BRIDGE, N.J.
CAR WHEELS & AXLES
DRAW HOOKS AND FORGINGS.
LEWIS H. TAYLOR Pres't
S. P. RABER SUP'Y
NEW YORK OFFICE 93 LIBERTY ST.

STEEL TIRED WHEELS
MADE UNDER SAX & KEAR'S PATENT
FOR LOCO TRUCK AND TENDER PASSENGER CAR SERVICE

Southern Agent, WM. J. NICOLLS, 5 Post Office Avenue, Baltimore.

G. G. LOBDELL, Pres't
P. N. BRENNAN, Treas.
Lobdell Car-Wheel Co.,
WILMINGTON, DEL.,
Manufacturers of
LOBDELL'S PATENT COMBINATION (DOUBLE PLATE),
IMPROVED SINGLE PLATE AND IMPROVED
HOLLOW SPOKE WHEELS,
Furnished with or without Axles; adapted for Broad and
Narrow Gauge and Street Roads.
MAKERS OF IRON AND BRASS CASTINGS, ETC.
Also Manufacturers of CHILLED ROLLS, for Paper
Brass, Copper and Rolling Mills.

UNION FORGE AND IRON MILLS, (WILSON WALKER & CO.)

MANUFACTURERS OF



Equalizing Bars for Car Trucks, "Miller Hooks" and Buffers.

UNIVERSAL PLATES FOR GIRDERS, BRIDGES, &c.
Works, corner Twenty-ninth and Railroad Streets, Pittsburgh, Pa.

THE LANE & BODLEY CO.,

John and Water Sts., Cincinnati,

Manufacturers of their Perfectly Graduated

Stroke Power

MORTISING MACHINE

Hangers, Pulleys, Couplings and

Shafting.

LOWEST PRICES AND BEST QUALITY.

Send for our Price Lists.

FERRIS & MILES,

24th and Wood Sts.,

PHILADELPHIA,

Manufacturers of



Engine Lathes, Axle Lathes, Planing and Slotting
Machines, Wheel Bore, Upright Drills, Re-
dial Drills, Punching and Shearing
Machines, &c. Steam Ham-
mers Drops, &c.

BARNUM RICHARDSON CO., SALISBURY, CONN.,



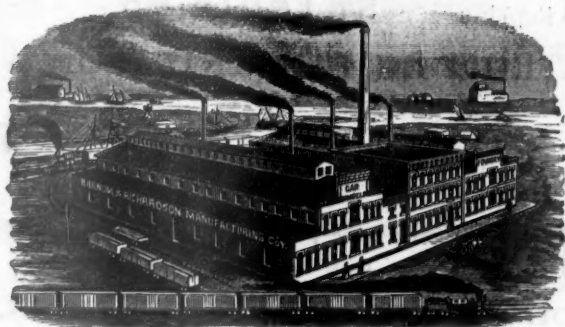
MANUFACTURERS OF
CHARCOAL PIG IRON FROM SALISBURY ORES,
AND CHILLED  CAR WHEELS.

All Work from this Establishment made from Salisbury Iron
AND WARRANTED.

ADDRESS WM. H. BARNUM, Pres't. OR,
LIME ROCK, CONN. ALBERT ALLING, Agent for Sale of Pig Iron,
64 SOUTH JEFFERSON ST., CHICAGO, ILL.

BARNUM & RICHARDSON MANUFACTURING CO.,

64 1/2 South Jefferson Street, Chicago, Ill.



MANUFACTURERS OF
Chilled Car and Locomotive Wheels, from Pure
Salisbury Iron,

ALSO MANUFACTURERS OF
CAR AND ALL OTHER DESCRIPTIONS OF CASTINGS.
All Work Warranted.

WM. H. BARNUM, President, LIME ROCK, CONN. | ALBERT ALLING, Gen'l Manager, CHICAGO, ILL.

ENSIGN MANUFACTURING COMPANY

Huntington, W. Va.,

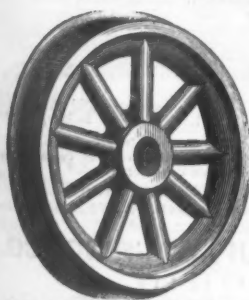
MANUFACTURERS OF

WHEELS,

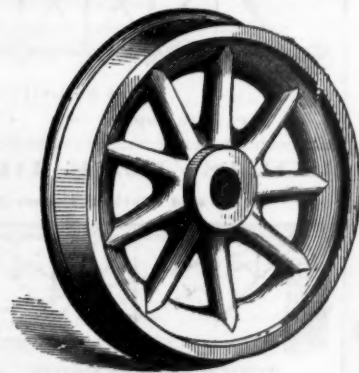
For Passenger, Freight and
Coal Cars, and Locomotive
Trucks and Tenders. Also
all kinds of Car and Bridge
Castings.

W. H. BARNUM, Pres.,
Salisbury, Conn.

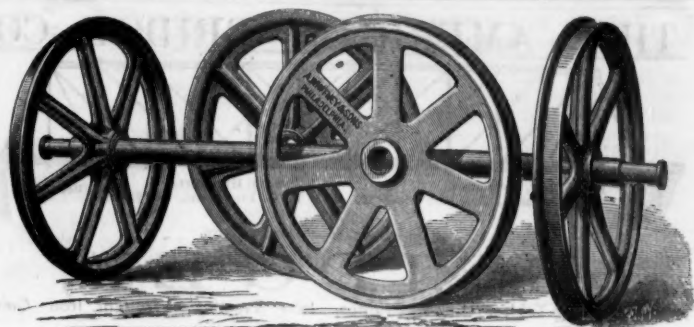
E. ENSIGN, Treas.,
Huntington, West Va.



RAMAPO WHEEL AND FOUNDRY COMPANY,



MANUFACTURERS OF
Wheels for Drawing Room and Sleeping Coaches, Locomotives,
TENDERS, PASSENGER AND FREIGHT CARS
W. W. SNOW, Sup't & General Manager, Ramapo, Rockland Co., N. Y.



A. WHITNEY & SONS, CAR WHEEL WORKS,
Callowhill and Sixteenth Streets, Philadelphia, Pa.



BALTIMORE CAR WHEEL COMPANY,

OFFICE 15 SOUTH STREET,

Manufacture Wheels

FOR

City and Steam Railways,

With or without Axles.

WHEELS OF ALL PATTERNS

Made to Order and in Stock

This Company using strictly Balti-
more Charcoal Iron, (which has no
superior and few equals, for making
Car Wheels,) and annealing their
Wheels by the most approved pro-
cess, warrant them free from strain,
and equal in tenacity and uniformity
of chill to any made.

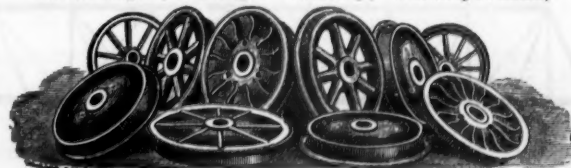
W. S. G. BAKER, President.
J. M. LAWFORD, Secretary.

Works, corner Essex and Concord Streets, Canton, Baltimore, Md.

LEHIGH CAR-WHEEL WORKS,

McKEE & FULLER,

Catasauqua, Lehigh County, Pennsylvania,



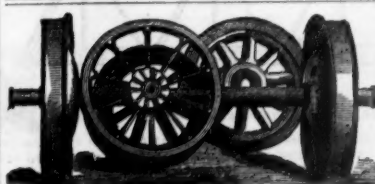
MANUFACTURERS OF

Wheels for Locomotives, Tenders, Passenger, Freight, Coal, City Passenger and Mine Cars.
Wheels Fitted to Axles, and Prices Furnished on Application.
CAPACITY, 300 WHEELS PER DAY.

Makes All Kinds of
FREIGHT CARS,

and the BEST of
CAR WHEELS.

J. L. GILL
Columbus, Ohio.



MOWRY
CAR AND WHEEL WORKS,

Manufacturers of Cars and CAR WHEELS of all
descriptions. Wheels and Axles, Chilled Tires;
Engine, Car and Bridge Castings, of any pattern,
furnished to order at short notice. Wheels of all
sizes constantly on hand.
OFFICE: No. 29 WEST THIRD STREET, Cincinnati, O.
WORKS: Eastern Av. & Lewis St., Cincinnati, O.
N. G. GREEN, Sup't, Cincinnati.

THE AMERICAN BRIDGE CO.



H. A. RUST, President.
L. B. BOOMER, Resident Director.

EDWARD HEMMERLE,
W. G. COOLIDGE, Sec'y. } Engineers.

MANUFACTURERS AND BUILDERS OF

BRIDGES,

Roofs, Turning-Tables, Pivot Bridges, Iron Trestles Wrought Iron Columns
Heavy Castings,

GENERAL IRON AND FOUNDRY WORK.

BUILDERS OF

PNEUMATIC MASONRY, AND SCREW-PILE SUBSTRUCTURES.

Iron Bridges and Roofs upon the principal Railroads in the United States illustrate designs and attest the character and extent of products of Works.

Proposals accompanied by Plans, Specifications and Lithographs promptly submitted upon application.

WORKS: Cor. Egan and Stewart Aves. | OFFICE: No. 310 LaSalle St., Cor. Adams.
Address THE AMERICAN BRIDGE CO., Chicago.

CINCINNATI BRIDGE COMPANY.



365 FT. SPAN BRIDGE OVER THE GREAT MIAMI RIVER, FRANKLIN, OHIO.

Manufacturers and Builders of Whipple's Iron Truss and Arch Bridges,
FOR RAILWAYS AND HIGHWAYS;

Also ROEBLING'S CELEBRATED STEEL WIRE SUSPENSION BRIDGES.

All kinds of Bridge irons made to order. Only best quality of material used. Send notice of Bridge lettings.

J. W. SHIPMAN, Pres. and Eng.

Address CINCINNATI BRIDGE CO.,

H. A. MANNING, Sec. and Treas.

31½ West 3d St., Cincinnati, O.

J. D. HUTCHINSON, Vice-President and Eastern Manager, Peekskill, N. Y.

NIAGARA BRIDGE WORKS

BUFFALO, N. Y.,



**BUILDERS OF IRON LATTICE BRIDGES
FOR RAILROADS AND HIGHWAYS.**

PLATE GIRDERS, COMPOSITE BEAMS, ROOFS, PLATE TURNABLES, &c

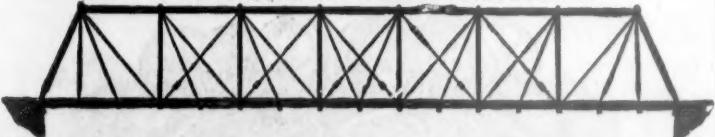
S. J. FIELDS, ENGINEER.

GEO. C. BELL, MANAGER.

Office and Works: Forest avenue, cor. Niagara street.

KELLOGG & MAURICE,

OFFICE AND WORKS: ATHENS PA.



Iron and Wooden Bridges, Roofs, Turn-tables, Etc.

THE MILWAUKEE BRIDGE AND IRON WORKS

G. W. JAMES & CO., Milwaukee, Wis.



BALTIMORE & OHIO RAILROAD BRIDGE, SOUTH CHICAGO, ILL.

BALTIMORE BRIDGE CO.,

54 Lexington Street, Baltimore.



C. SHALER SMITH, Pres. & Ch. Eng.

F. H. SMITH, A. Eng. & Gen. Supt.

C. H. LATROBE, A. Eng., Sec. & Treas.

C. C. WRENTHAM, Supt. of Erection.

Design and Construct Iron, Steel and Composite Bridges and Roofs of any form or span desired. Special attention is called to our Wrought-Iron Trestles and Viaducts, patented in United States, England, France and Belgium, and of any height or length. Lithographs and information promptly furnished.

THE DELAWARE BRIDGE COMPANY

Office
152 WALL STREET
NEW YORK.



ENGINEERS AND CONTRACTORS FOR THE CONSTRUCTION
OF IRON AND WOODEN BRIDGES, STEEL SUS-
PENSION BRIDGES, ROOFS, VIA-
DUCTS AND TURN TABLES.

Manufacturers of Die Forged Eye-bars, Truss Bolts, Compression Members and Bridge materials generally.
O. MACDONALD, President and Engineer. | WM. M. FINCKE, Secretary and Treas.



H.S. Hopkins & Co.
BRIDGE BUILDERS & CONTRACTORS

BRIDGES, TRUSS ROOFS, TURNABLES AND DEPOTS.

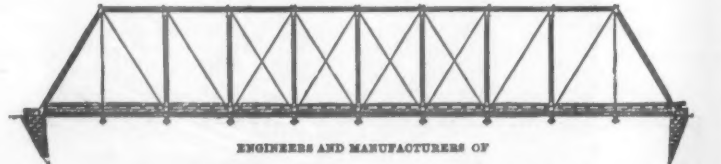
BUILDERS OF BOTH, SUB- & SUPERSTRUCTURES.

H.S. Hopkins

ST. LOUIS, MO.

Wm. McCully

DETROIT BRIDGE AND IRON WORKS, OF DETROIT, MICH.,



ENGINEERS AND MANUFACTURERS OF

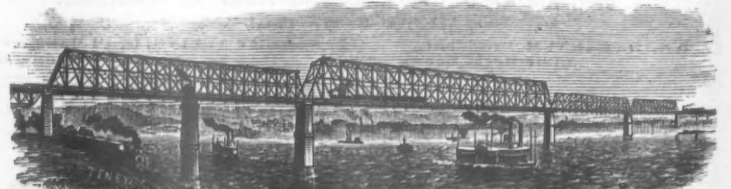
Iron Bridges. Iron Roofs, Etc.

WILLARD S. POPE, Pres. and Engineer.

WM. C. COLBURN, Sec. and Treas.

THE KEYSTONE BRIDGE COMPANY,

PITTSBURGH, PA., Builders of Long-Span Bridges.



CHANNEL SPAN 520 FEET.

CINCINNATI SOUTHERN RAILWAY BRIDGE.

Newport & Cincinnati, 420 ft.

Cincinnati Southern Ry., 520 ft.

Steubenville, 320 ft.

Bellair, 350 ft.

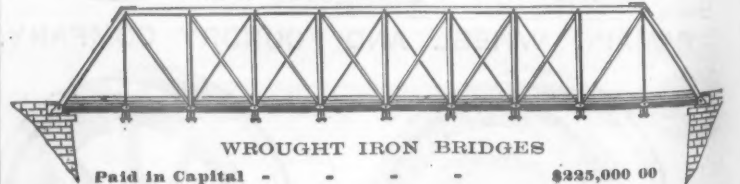
Parkersburg, 350 ft.

Engineers and Builders of WROUGHT-IRON and WOODEN BRIDGES, IRON ROOFS and BUILDINGS. Manufacturers of Wrought-Iron Turnables, Wrought-Iron Columns, Weldless Chords, Castings, Bolts, General Machine and Mill Work. Illustrated Album sent on application to undersigned.

J. H. LINVILLE, President,

218 South Fourth St., Philadelphia.

KING IRON BRIDGE & MANUFACTURING CO., CLEVELAND, OHIO.



WROUGHT IRON BRIDGES

Paid in Capital -

\$225,000 00

LOUISVILLE BRIDGE & IRON CO.,

Office and Works: Corner Oldham and 11th Streets, Louisville.



BUILDERS OF

FINK'S SUSPENSION AND TRIANGULAR TRUSSES, and other forms of Iron and Combination Bridges. Also Manufacturers of Iron Roofs, Turn-ables, Frogs, Switches, etc.

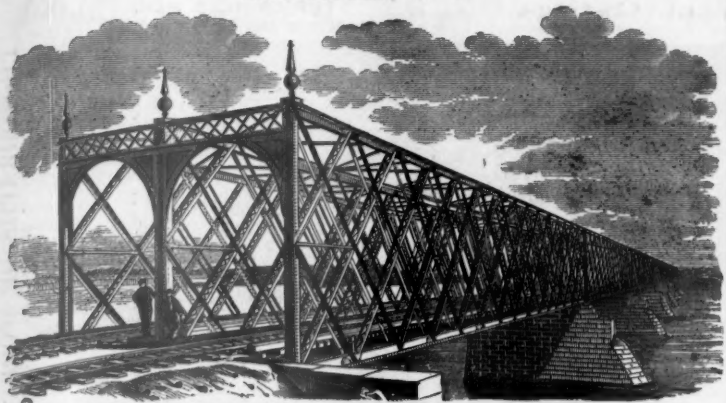
ALBERT FINK, President.

A. F. CHROGAN, Secretary.

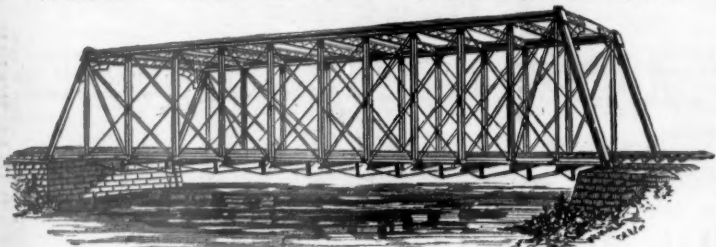
F. W. VAUGHAN, } Engineers

GILMAN TRAFTON, }

E. BENJAMIN, Superintendent of Works.

LEIGHTON BRIDGE AND IRON WORKS,
ROCHESTER, N. Y.

THE SPRINGFIELD BRIDGE, BY LEIGHTON BRIDGE AND IRON WORKS.
Wrought-Iron Riveted Lattice Railroad and Highway Bridges, Wrought-Iron Water Pipe and General Riveted Work.
ORDERS SOLICITED FROM CIVIL ENGINEERS AND CONTRACTORS.

WROUGHT-IRON BRIDGE CO.

D. HAMMOND, President. | Office and Works, CANTON, O. | JOB ABBOTT, Engineers.
WM. BRITTON, Secretary. | H. G. MORSE, |
Manufacturers and Builders of all Wrought-Iron Railway and Highway Truss, Arch and Swing Bridges, Plate and Lattice Girders, Iron Roofs, Turn-Tables, Iron Piers and Trestles. Have over TWENTY-FOUR MILES of their IRON BRIDGES now in use in twenty-four different States and Canada. ILLUSTRATED ALBUM and estimates sent on application.

PHOENIXVILLE BRIDGE WORKS.

CLARKE, REEVES & CO., Engineers and Builders of



Iron Bridges, Viaducts, Roofs, Turn Tables, etc

SPECIALTIES:—Accurate workmanship; the use of double-refined iron; no welds; Phoenix upper chords and posts, the best form of strut known; all work done on the premises, from ore to finished bridge.

ILLUSTRATED ALBUM mailed on receipt of 75 cts. at 410 WALNUT STREET, PHILADELPHIA, PA.

J. H. COFRODE.

F. H. SAYLOR

J. H. COFRODE & CO.,**Engineers and Bridge Builders.**

DESIGN AND CONSTRUCT IRON, WOODEN AND COMBINATION BRIDGE AND ROOF TRUSSES, &c.,

OFFICE:

No. 530 Walnut Street, Philadelphia.

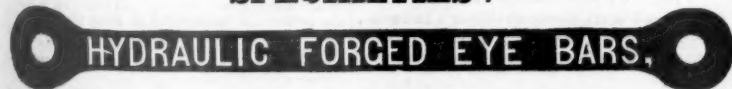
Edge Moor Iron Co.,

(Works at Edge Moor, on Delaware River,
Post Office, Wilmington, Delaware,
MANUFACTURE ALL KINDS OF

IRON WORK

FOR

BRIDGES, ROOF TRUSSES AND BUILDINGS.

SPECIALTIES:**HYDRAULIC FORCED EYE BARS.****HYDRAULIC FORGINGS and HYDRAULIC RIVETED WORK.**

Specifications from Railroad Companies, Engineers and Contractors solicited, upon which estimates will be promptly furnished.

WILLIAM SELLERS,
President.ELI GARRETT,
Sec'y & Treas'r.GEORGE H. SELLERS,
Gen'l Sup't.**ELIZABETHPORT STEAM CORDAGE COMPANY,**

MANUFACTURERS OF

Manilla, Sisal and Tarred Cordage,

46 SOUTH STREET,

NEW YORK.

R. M. FULTON,
D. B. WHITLOCK,
A. W. LUKENS.

SAFETY RAILROAD SWITCH

WITH
MAIN TRACK UNBROKEN,
RAILROAD CROSSINGS, FROGS,
AND OTHER

ROADWAY SUPPLIES,
Manufactured by

THE WHARTON

RAILROAD SWITCH COMPANY,

Office, 28 South 3d street.

Works, 23d and Washington avenue,
Philadelphia.**LOWTHORP & HENDERSON,**
ENGINEERS AND BUILDERS

OF

BRIDGES AND TURN TABLES

OF WROUGHT IRON, OR COMBINATION OF
WROUGHT AND CAST.

78 East State street, Trenton, N. J.

F. C. LOWTHORP, C. E. J. J. HENDERSON,

FOR SALE,

Or to Lease for a Term of Years:

The Car Works of the Buffalo Car Company. The works are new, having a capacity of 12 cars per day; Buildings of brick, slate roofs, heated by steam, with fire hydrants with hose complete. The Machinery is all new and of the best Philadelphia make. Twelve acres of land, and railroad connections with both broad and ordinary gauge roads. The Works can be started without a dollar's expense.

BUFFALO, N. Y.

N. C. SCOVILLE, TRUSTEE.

"TAYLOR'S"

HAMMERED CRUCIBLE CAST STEEL

LOCOMOTIVE TIRES.

AND

BEST YORKSHIRE BAR IRON

RANDALL & JONES,

Oliver street, Boston.

PENCOYD IRON WORKS.**A. & P. ROBERTS & CO.,**

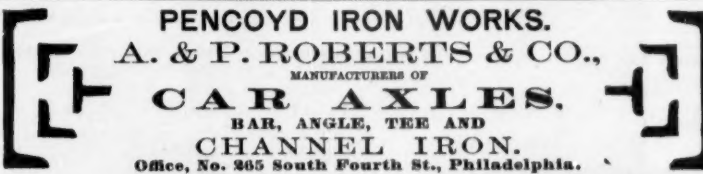
MANUFACTURERS OF

CAR AXLES.

BAR, ANGLE, TEE AND

CHANNEL IRON.

Office, No. 265 South Fourth St., Philadelphia.



S. SHELDON, Sec'y & Treas. | H. M. CLAFLEN, Prest. | M. W. BRAND, Gen. Manager.

THE LOOMIS NUT LOCK WASHER CO.,

CLEVELAND, OHIO.



Sole Manufacturers of the celebrated LOOMIS NUT LOCK WASHER, for Railroad Tracks, Cars, etc. It is a PERFECT NUT HOLDER. It is made to fit any sized bolt or fish-plate (requiring but one nut), and is of the best cast or spring steel, with a perfect spring; therefore WARRANTED not to break or set. It entirely compensates the expansion and contraction of the iron, and the nut will, in NO CASE, turn off of its own accord, however great the jar or strain. ORDERS SOLICITED AND PROMPTLY FILLED.

METCALF, PAUL & CO.,

Make a Specialty of

SOLID STEEL**RAILROAD TRACK TOOLS**

Also Sole Manufacturers of

THE PATENT**VERONA NUT LOCK.**

331 Penn Ave.

Send for our New Catalogue.

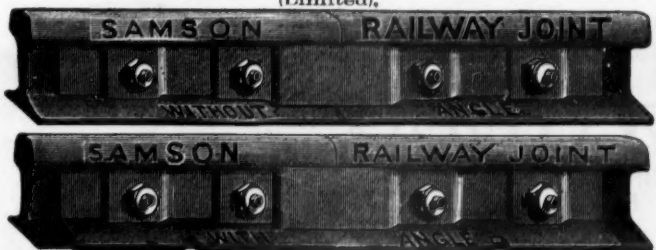
W. H. WAKEFIELD, Chairman.

WESLEY WILSON, Treasurer.

R. LONG, Secretary.

THE AMERICAN RAILWAY SUPPLY CO.

(Limited).



Manufacturers of the Samson Railway Joint, and Dealers
in and Agents for Railway Supplies Generally.

P. O. LOCK BOX 1,177.

OFFICE, No. 376 Penn
Ave., Pittsburgh, Pa.CHAS. I. WICKERSHAM, General Eastern Agent,
Office, 265 South Fourth St., Philadelphia.Patented Nov. 9,
1875.**ATWOOD CONICAL LOCK NUT.**

This nut is represented in the engraving on the right, and is made of a conical form on the under side, and fits into the bolt hole which is made of the same shape. The cone and square portions are slotted so that when screwed up into the conical hole, the nut is compressed and clamps the bolt tightly, so that it cannot be shaken loose. The effect of wear is to make it fit the hole more accurately, so that when it is again tightened up it will be less liable to become loose than before it was worn. The conical nut is intended especially for fish plates and bolts.

The engraving on the left represents a square nut cut apart on the top side only. The under side is made concave, so that in screwing it up the hole on the upper side is contracted and clamps the bolt in the same way as the conical nut. The square nut is intended for car work bridges and similar purposes.

The conical nuts are now extensively used in the track of the Philadelphia, Wilmington & Baltimore and Boston & Albany, and have been applied on a number of other railroads. It is simple in construction, being in one piece, has a longer bearing on the bolts than other nuts, and cannot strip the threads, and will always fit the bolts, no matter how loosely the thread is cut.

THE ATWOOD CONICAL LOCK NUT AND MANUFACTURING CO.,
No. 40 Broadway, Room 41, P. O. Box 1,049, New York.

MANUFACTURERS OF ROLLING STOCK FOR RAILROADS, FROGS, CAR WHEELS,
 Capital Stock, \$750,000.
 Grounds Occupied, 18 Acres.
 Capacity, 15 Freight Cars & 160 Car Wheels per day.
 And all Kinds of Castings.
 10 Passenger and Baggage per Month.
 EMPLOY 1,000 MEN.
 Six Million Feet Lumber in Store.

SPECIAL ATTENTION GIVEN TO NARROW GAUGE WORK



E. E. BARNEY, Pres't.
 PRESERVED SMITH,
 Vice-Pres't and Treas.

ESTABLISHED 1849.
BARNEY & SMITH M'FG CO.,
 DAYTON, OHIO.

E. J. BARNEY, Sup
 J. D. PLATT, Sec'y,
 F. E. SMITH, Ass't Sec'y.

PHOTOGRAPHS OF WORK SENT ON APPLICATION.

BALDWIN LOCOMOTIVE WORKS.



BURNHAM, PARRY, WILLIAMS & CO., Philadelphia,
LOCOMOTIVE ENGINES.

Especially Adapted to Every Variety of Railroad Service, including
 Mining Engines and Locomotives for Narrow-Gauge Railways
 All work accurately fitted to gauges, and thoroughly interchangeable. Plan, Materials, Work-
 manship, Finish and Efficiency fully guaranteed.

GEO. BURNHAM. CHAS. T. PARRY. WM. P. HENSZEY.
 EDWARD H. WILLIAMS. EDW. LONGSTRETH. JOHN H. CONVERSE.

CAYUTA WHEEL & FOUNDRY CO.,

P. O. Address: WAVERLY, N. Y.,
 Works at Sayre, Pa.

MANUFACTURERS OF
WHEELS

FOR
 TENDERS,
 PASSENGER,
 FREIGHT
 AND COAL
 CARS;

ALSO
CASTINGS OF EVERY DESCRIPTION
 REGINALD CANNING, Supt.



LOUISVILLE CAR-WHEEL
 AND
RAILWAY
SUPPLY COMPANY,
 491 East Jefferson St.,
LOUISVILLE,
KENTUCKY.

THE "EUREKA" STATION TICKET

Is a combination of Station, Stop Over and Half Fare Ticket. Only one form required for an entire line which is good at all stations and in all directions; It also does away with Conductors' Private Checks.

Manufactured solely by the Am. Duplex Ticket Co., who also apply their principle to Cash Fares, Excess Baggage, Stop Over, and numerous other forms of
RAILROAD AND STEAMBOAT TICKETS.

These tickets have been in successful operation for the past four years, and are now in use upon more than One Hundred and Twenty-five Roads, including most of the principal lines in this country and Canada. Samples and information furnished with pleasure by

W. H. CAMPBELL, Manager, 860 Broadway, New York.

HAMILTON RUBBER CO., Trenton, N. J.,
 MANUFACTURERS OF

RUBBER GOODS,
 FOR MECHANICAL PURPOSES.
CAR SPRINGS A SPECIALTY.
 Send for Price List and Discounts.

POTTSVILLE SPIKE, BOLT AND NUT WORKS.

GEO. D. ROSEBERRY, Machine Bolts,
 MANUFACTURER OF
Railroad and
MINING SPIKES Bolt Ends, Wood Screws,
 COLD-PRESSED NUTS, &c.,
POTTSVILLE, PA.

PLEASE NOTICE:

Several copies of the Railroad Gazette for
January 15 and May 19, 1876,
 are wanted. Those who do not preserve files are especially requested to return these numbers. Fifteen cents each will be paid for them, or two weeks' subscription will be credited—as may be preferred. Address the Railroad Gazette, 73 Broadway, New York.

BOUND VOLUMES.

The 88 numbers of the Railroad Gazette issued during the year 1876, substantially bound with muslin sides and leather backs and corners, making a large quarto volume of 574 pages, will be ready for sale on or about January 13 at the Railroad Gazette office. Price \$6.00 each. Subscribers may exchange their complete files for bound volumes on payment of the cost of binding, \$2. Missing back numbers can in most cases be supplied, price 10 cents each.

THE VERRUGAS VIADUCT

Compared with Several Other Viaducts,
 By MR. ERNEST PONTZEN, an eminent Austrian Engineer; accompanied by a two-page engraving of the Verrugas Viaduct, and a letter by Mr. Charles Bender, C. E., on "German Theorists and American Bridge Engineering." Mr. Pontzen gives a brief description of the ten most celebrated viaducts in Europe and a detailed account of the Verrugas Viaduct in Peru, together with comparisons of their cost and methods of construction. A valuable pamphlet for engineers to study and preserve for reference. Price, 40 cents. Address, The Railroad Gazette, 73 Broadway, New York.

THE RAILROAD PROBLEM.

A Lecture delivered before the Lowell Institute, Boston,

By CHARLES FRANCIS ADAMS, Jr.

Revised by the author. Issued in a neat pamphlet. The latest utterance of the most eminent student of the relation of railroads to the State. Price 15 cents. Address

The Railroad Gazette, 73 Broadway, New York.

THE CATECHISM OF THE LOCOMOTIVE.

By M. N. FORNEY,

Mechanical Engineer.

Is an elementary treatise on the Locomotive, written in the form of questions and answers. The book contains 600 pages and 250 engravings, including 16 full-page plates of different styles of locomotives.

The principles of operating and details of construction are so clearly explained as to enable any intelligent person to thoroughly understand them. The book is written without the use of technical terms or abstruse mathematical calculations, and is intended for all classes of readers.

No popular treatise on the locomotive in the English language gives so clear, simple and complete a description of the construction and working of the locomotive engine, and no work of any kind, however extensive, gives so full an account of modern American practice in locomotive construction, and of the latest scientific discoveries which have application to the operation of the locomotive, especially those relating to combustion, heat, etc., all of which the author has endeavored to make plain to those who have not even the rudiments of a scientific education.

Price \$2.50. Address The Railroad Gazette, 73 Broadway, New York.

A NEW PAMPHLET.

Now Ready for Delivery—Price 75 Cents.
INVESTIGATIONS INTO THE COST OF PASSENGER TRAFFIC ON AMERICAN RAILROADS, WITH SPECIAL REFERENCE TO THE COST OF MAIL SERVICE.

By ALBERT FINK,

late Vice-President and General Superintendent of Louisville & Nashville and Great Southern Railroad.

This work was published some years ago, and a few copies distributed at the time, but it has never heretofore been offered for sale. Selections from it (including a chapter on the transportation of mail) were published in the Railroad Gazette at the time, attracting general attention, as the most satisfactory discussion of the subject ever published. Mr. Fink has made some additions to the original work, which will increase its value.



FRIDAY, FEBRUARY 23, 1877.

Improved Iron Rails.

At a meeting of the Iron and Steel Institute in England some months ago, Mr. Isaac Lowthian Bell, who is one of the best authorities in the world on iron metallurgy, in the course of an address mentioned briefly that experiments in progress gave reason to believe that it would soon be possible to produce an iron rail of such quality as to be nearly or quite equal to a Bessemer rail, and at a cost materially less than that of Bessemer steel. Very great interest was manifested in this statement, and it was repeated by the press throughout the world, but latterly without the qualifications which Mr. Bell made, so that many have been led to believe that the improved process is fully tested and in operation. There has been correspondence on the subject in recent numbers of *Engineering* which is interesting in view of the lack of more definite information. One writer intimates that the wish was father to the thought in Mr. Bell's case. He is an iron-master in the Cleveland district, which has been specially affected by the diversion from iron to steel because the Cleveland iron is not suitable for making Bessemer metal; he is also a director of the Northeastern Railway Company, a very large part of whose traffic is dependent on the iron manufactures of the Cleveland district. This company, it was reported, would construct extensive works for making rails by this process. The correspondent in question says that an old firm in the district made rails from blooms from the Danks puddling furnace, and that on learning this the railroad company gave up the idea of establishing new works.

Another correspondent in reply makes a more definite statement of the nature of the improved iron rail and of the process by which it is made than we have seen heretofore, and though he cites no experiments or examples, his statement will be read with interest. He says:

"For near to twenty years this question has engaged the attention of Mr. Harrison, and the facts are these: a rail of homogeneous iron, or made from what I would call a puddled ingot, rolled direct without the weakening process of piling, with the head case-hardened, will outlive the best steel rail in endurance, while the chance of rupture is destroyed.

"Rails of this kind can be made as hard on the surface as hardened steel, while the general character of the rail for ductility remains as perfect as the character of wrought iron can make it.

"Such rails have undergone a service of over fifteen years of thorough legitimate wear, not cases of isolated rails, but over many miles of road. These are facts that no engineer of note would venture to despise. Mr. Harrison's next step was to ascertain their possible manufacture in point of sustained quality and ultimate cost.

"In this he has been assisted by Mr. I. L. Bell, M. P. * * * The process he proposed has in one respect only been altered, and the facts I believe are as follows: That homogeneous rails will be made in Cleveland at a cost much lower than was ever anticipated; the exact price cannot yet be stated, as the plant is incomplete, but it will be very far beneath that of the cheapest steel. It will suffice for any who care to count the possible cost, that 21 cwt. of pig will make one ton of rails; from the cold pig to the finished rail 20 cwt. of coal only is necessary; the blooms are worked right off without cooling; there is only the cost of once shingling; the labor and wearing expenses of the furnaces are less now than that of hand puddling, and, inclusive of the 12s. per ton for case-hardening, the rails will not exceed the cost of the common piled rail hitherto made in the Cleveland district.

"It would seem a source of exultation to 'X. Y.' should the homogeneous process fail, but this is placed beyond the reach of such disaster. The success attending the process at Messrs. Hopkins & Co.'s, the marked improvement in the Crampton method, tend to confirm this. Mr. Crampton can puddle 20 cwt. of iron from 7 per cent. of fuel, and form the entire mass into one solid ingot. He can give 95 per cent. of the charge of pig as finished bars or rails of the most homogeneous iron. A period of transition is at hand; much of the widened employment of steel is due to its assimilation to the better qualities of iron; iron raised in character will compete in many respects with steel, notably in rails."

Mr. Joy on the Detroit Tunnel.

At an informal meeting held in the City Hall at Detroit recently to consider the tunnel project, Mr. James F. Joy made some remarks which are thus reported by the *Detroit Tribune*: James F. Joy, who has heretofore absented himself from the tunnel meetings, was present and expressed his opinion quite freely. He said that the great difficulty to be apprehended in forming a company, or raising the necessary funds to build the tunnel, was the lack of faith on the part of European capitalists in investments of this character in this country. It is conceded that the money must come from abroad, as our own capitalists will not go into new enterprises in times like these. Ten years ago enough money could have been raised in the United States; but it cannot be done now. While foreign capitalists were willing to put money into American securities, they have become exceedingly loth to invest in anything where the ultimate cost is uncertain. The estimates of engineers are invariably too low. Gen. Smith argued that a tunnel, together with its franchises and appurtenances, would not cost to exceed \$3,000,000. Mr. Joy believed that it would require just double that amount. When the tunnel was attempted in this city five years ago, the engineer's estimate was \$70,000, and but six months' time to complete the work, yet they labored two years, expended \$200,000, and were told it would take five years to get through, if they went through at all. In addition to great expense to be incurred are the almost insurmountable difficulties that arose from time to time. At one time during the construction of the Hoosac tunnel, a vein of quicksand was struck which filled up the whole bore, and the entire vein had to be excavated out before the work could be proceeded with. The expense of the past would be of value in the future, but the same difficulties would be met with in all great enterprises. Mr. Joy believed that the former work in the city had been properly conducted. He regarded Mr. Chesbrough, the engineer of that work, as the most expert underground engineer living, and looked upon his plans as the most feasible ones ever presented. In excavating they advanced at the rate of a foot

a day, and yet they encountered so much quicksand as to be compelled to change the position of the tunnel two or three times. He was familiar with the soundings of the river from the fort to the island, and was of the opinion that the best place for the mouth of the tunnel was at the foot of Third street. Foreign capital has been employed in the bridges of Brooklyn and St. Louis, and in both cases the structures will cost four or five times the amount of the original estimates. Gen. Smith will have to satisfy his friends in this regard before he can make any terms with them. Mr. Joy expressed himself as having but little faith in Smith's plans. His proposition to have the top of the tunnel on the bed of the river was foolish. Soundings have disclosed the fact that mud to the depth of twenty feet or more rests on the bed of the river. If Smith sinks his tunnel into this mud; and if, as he believed, the mud washes out when the water is high, the tunnel would be deemed unsafe, as it would be exposed to the action of the water.

In the course of the conversation Mr. Joy stated that he would be willing to promise that the railroad companies would agree to use a tunnel provided one was constructed, and to pay annually \$200,000 in toll.

Master Mechanics' Association—Circular of Inquiry on Engine and Tender Trucks.

The undersigned, a committee appointed at the last annual convention of the Association to report on "The Best Form of Construction of Engine and Tender Trucks Adapted for Different Classes of Engines," beg to submit the following questions, to which they respectfully request you will reply at your earliest convenience, giving them also any additional information you possess on the subject:

ENGINE TRUCKS.

1. Are the standard trucks under your passenger and freight engines the same pattern? If not, wherein do they chiefly differ?
2. Do you use cast or wrought-iron saddles in your standard truck?
3. Do you use cast or wrought-iron jaws or pedestals in your standard truck?
4. Do you use both outside and inside bearings in your standard truck?
5. Do you recommend both outside and inside bearings?
6. Is your standard truck centre or side-bearing, and stationary bolster or swing—lateral motion?
7. Which do you consider the best for an engine truck, centre or side-bearing, and with or without swing (lateral) arrangement?
8. What is the length of the wheel-base of your standard engine truck?
9. Do you use safety chains or any other method of checking the motion of truck? If the former, state how many, thickness of iron and where placed.
10. Give diameter of wheels you use in your standard engine truck.
11. What description of wheel do you use under engine truck?
12. Of what material are the axles under your standard engine truck?
13. Which kind of material do you prefer for said axles? and state your reasons for same.
14. Give diameter and length of bearing.
15. Do you use single pairs of swing wheels? If so, how many engines have you with this arrangement, and how many with the 4-wheeled truck?
16. Under what class of engine do you use a single pair of swing wheels?
17. What is your opinion as to the working of a single pair of swing wheels as compared with your 4-wheeled standard truck?
18. Do you use centre (hinge) pins in your standard truck?
19. Please oblige the committee with a tracing of the standard engine truck in use on your road; or, if more convenient, give a general description of same, explaining how many springs, where they are placed, how acted upon, etc.

TENDER TRUCKS.

1. Are the standard trucks under your passenger and freight tenders the same pattern? If not, wherein do they chiefly differ?
 2. Have all your tender trucks outside bearings?
 3. Is your standard tender truck centre or side-bearing, and stationary bolster or swing—lateral motion?
 4. Which do you consider the best truck for a tender, centre or side-bearing, and with or without swing arrangement?
 5. What is the length of wheel-base of your standard tender truck?
 6. Do you use safety chains, or any other method of checking motion of truck? If the former, state how many, thickness of iron, and where placed.
 7. What is the diameter of the wheels you use under your standard passenger tenders, and what under your freight tenders?
 8. What description of wheels do you use in your tender trucks?
 9. Of what material are the axles under your standard tender trucks?
 10. Which kind of material do you prefer for tender axles, and state your reasons for same?
 11. Do you use any arrangement of safety beam in your tender trucks to support axles in case of breakage?
 12. Please oblige the committee with a tracing of the standard tender truck in use on your road; or, if more convenient, a general description of same, stating how many and what kind of springs, where placed, how acted upon, etc.
- Please insert the answers to questions in the spaces left for that purpose, if room enough, otherwise, on separate sheet, and return all to the Chairman of the Committee, P. Clarke, Mechanical Superintendent, Northern of Canada, Toronto, previous to March 31, 1877.

P. CLARKE, Mech'l Supt., Northern of Canada.
W. A. ROBINSON, Hamilton, Ont.
A. GOULD, Rochester, N. Y.

Master Car Builders' Association—Upon Substituting Steel for Iron and Iron for Wood in Car Construction.

To the Members of the Master Car Builders' Association and others having charge of Passenger and Freight Cars:
GENTLEMEN: Your Committee on the substitution of steel for iron and iron for wood in car construction, appointed at your last annual meeting, held in New York, June 16, 1876, would respectfully ask that you reply, as soon as possible, to the following questions:

- 1st.—Which do you prefer—steel or iron for truss or other rods in a car body? And please give your reasons for preference.
- 2d.—Which do you prefer—wood, iron or steel body bolsters? And please state your reasons.
- 3d.—Which do you prefer—iron or steel bolts? And give your reasons.
- 4th.—Which do you prefer—iron or steel wheels? And give your reasons.
- 5th.—Which do you prefer—iron or steel axles? And give your reasons.
- 6th.—Which do you prefer—wood, cast-iron, wrought-iron or steel brake shoes? And give your reasons.

7th.—Which do you prefer—iron or steel screws? And give your reasons.

8th.—Which do you prefer—iron or steel nails? And give your reasons.

9th.—What portions of a car now made of wood could, with advantage, be replaced with iron?

10th.—What portions of a car now made of iron could, in your judgment, be replaced with steel?

11th.—Have you substituted, in car construction, iron in place of wood, or steel in place of iron; if so, where, and with what results?

Please give the committee any other information bearing upon this subject that you may consider of importance.

All replies should be addressed to the Chairman.

Committee: W. R. DAVENPORT, Chairman, Erie Car Works, Erie, Pa.
J. B. HILL, Erie Railway Car Shops, Jersey City, N. J.

Transportation in Congress.

In the Senate on the 14th: Mr. Dorsey, of Arkansas, introduced the Texas & Pacific railroad bill, heretofore reported to the House by its Committee on Railroads.

The Pacific railroads sinking fund bill coming up for further consideration in Committee of the whole, an amendment was offered and then withdrawn by Mr. Boutwell, but renewed and strongly supported by Mr. Booth, to the bill of the Railroad Committee (which had been favored by the companies), making the annual payment of \$750,000 to the sinking fund by the Union and Central companies, in addition to instead of in lieu of the payments required by the existing law. This amendment was adopted by a vote of 22 to 20.

In the Senate on the 15th: Mr. Allison moved an amendment to the Pacific Railroad's sinking fund bill of the Committee on Railroads, the purport of which was to require each company to pay half-yearly such sums as, with interest compounded at 6 per cent., will extinguish the debt by 1905, the amount to be ascertained by the Secretary of the Treasury.

The House, on the 15th, went into Committee of the Whole on the bill limiting rates for transportation of freight over the bridge constructed by the Union Pacific Railroad across the Missouri, at Omaha, Neb. The bill provides that the Government Directors of said railroad company shall inquire into and fix the rates for transportation across said bridge.

Mr. Phillips, of Missouri, on behalf of the minority of the Committee on Pacific Railroads, offered, as a substitute, a bill fixing the rate of toll at \$5 for each car and 25 cents for each passenger.

In the Senate on the 16th: The question pending being on Mr. Booth's amendment to the Pacific railroads sinking-fund bill, the amendment was rejected by a vote of 24 to 28.

Mr. Christiancy, of Michigan, moved to strike out the sixth and seventh sections of the bill reported by the Committee on Railroads, which provide that the act shall be construed as a final settlement between the Government and the companies, if accepted by the companies within four months of the date of its passage, and so repeals all acts and parts of acts. In lieu of these sections, Mr. Christiancy proposed to insert a section providing that Congress shall at all times have power to alter and amend as well as repeal the act.

Mr. Chaffee, of Colorado, submitted an amendment to that of Mr. Christiancy, so as to provide that the act should be construed as a final settlement between the Government and the companies, if within four months after its passage it be accepted by the companies, and providing said companies shall faithfully comply with all the provisions of the act, and shall not be in default of any of the installments when due.

Mr. Chaffee's amendment was adopted by a vote of 30 to 22, and Mr. Christiancy's amendment so amended by a vote of 36 to 15.

In the House, on the 16th, Mr. Luntrell, of California, favored the minority report on regulating the Omaha bridge tolls, which provides for charges just one-half of those now levied.

Mr. Throckmorton, of Texas, favored the majority report.

Meeting of Railroad Men and "Others."

According to the notice which had been issued, and to which attention was called in an editorial article in the *Railroad Gazette* of Feb. 2, the usual monthly meeting, which is held at the rooms of the Car-Builders' Association on Liberty street, New York, assembled at that place on Thursday evening, the 15th inst. The meeting was called to order by the President, Mr. Garey, who announced the subject for discussion to be "The Relative Cost of Service of Chilled Cast-iron and Steel-tired Wheels." The subject, he said, was a very interesting one, and there have been a number of documents bearing upon it which have been sent in and which may be classified as follows: First, communications referring to the method of keeping the mileage of cars and wheels; second, reports of the mileage or service of wheels; and third, communications having reference to the best size of wheels. The communications referring to the best method of keeping mileage would be read first and then discussed, after which the others would be read and opportunity be given for their consideration.

The papers arranged under the first class consisted chiefly of blanks used by the Pullman Palace Car Company, the Boston & Albany and the Lake Shore & Michigan Southern for keeping the accounts of the car and also the wheel mileage, and blanks for keeping the wheel reports on the New York Central & Hudson River Railroad. Accompanying the blanks of the Lake Shore & Michigan Southern Railway was a letter from Mr. John Kirby, Master Car-Builders of that line, which was read, and in which he says that "the small sheet is the conductor's report of trains 4 and 5 between Chicago & Elkhart, on which is given the number of each car in each train, also the names of the sleeping cars. These reports come in from every conductor each day and night, so that by knowing the distance between each point it is easy to ascertain the mileage made by any of the cars. If this is kept up, it gives the mileage made by the wheels under these coaches from the time the wheels are put under until they are taken out. Sometimes wheels go under three different cars. It will be noticed that several pairs have been under two coaches. For example, one pair of Bowler wheels ran under the 'Garden City' (drawing-room car) from Sept. 2, 1875, to June 3, 1876, was put under coach No. 46 June 21, 1876, and was taken out Dec. 15, 1876. In this way we get the whole life of the wheels until they are worn out. This system of ascertaining the mileage made by wheels under passenger equipment is so simple that the work of computing the mileage after the conductors' reports and the wheel sheets are sent from my office is done by the Purchasing Agent's clerk, besides attending to all the business of the office, for an additional compensation of \$10 per month added to his regular salary. The conductors' blanks are no additional expense, and the wheel sheets also furnish other valuable information besides that required to show the service of the wheels. The practice of marking the wheels when put under I started in 1855. As the roads became consolidated I found it necessary to place on the back of the wheels the initial letter indicating the shop where the wheels were fitted to the axle. This was put on as soon as the wheels left the press, but the dates are not put on until the wheels are put under the car. Our passenger car wheels are guaranteed

50,000 miles, freight car wheels for two years, the mileage we cannot ascertain."

There was also a letter and rough drawing of a "machine for recording mileage" submitted by Messrs. Moon & Co., of Louisville, Ky. The machine, they say, records every revolution of the wheels under all circumstances, and will not fail to report, as engineers and conductors sometimes do. It would also report the mileage of cars while away from home on foreign roads, and thus do away with guess-work regarding the probable switching mileage of engines. The machine is a sort of revolution-counter attached to the axle of the car, but it was almost impossible from the drawing to form any idea of its practicability.

Mr. Forney remarked that he was at first disposed to regard it as entirely visionary, but on reflection he thought that if an instrument of this kind could be made of sufficient simplicity and at the same time be reliable and cheap, it might be found that it would be very useful.

Mr. Davenport said: Mr. Kirby has outlined a plan for keeping the mileage of passenger cars which is very simple, very complete and very inexpensive. It has been in use on the Lake Shore road for three years, and it works admirably. It is to be hoped that every road in the country before the close of this year will adopt some system of keeping passenger mileage. This will enable them to determine the relative merits of wheels, not the positive, because that will involve the keeping of the freight-car mileage as well; but it will give you results of such inestimable value that he could not think it possible that another year would elapse without all companies keeping their passenger mileage. He saw the other day in Cleveland a plan devised by Mr. Davies, of Cleveland, for keeping the individual mileage of freight cars. He proposes that all the roads of the country shall adopt a uniform plan of numbering their stations, having a terminus which shall be No. 0; then numbering each station from that by the number of miles it is from the terminus. For instance, a station that is 20 miles away is numbered 20 and one that is 400 miles away is numbered 400. Then when a car has gone from 0 to 20 you know it has gone 20 miles. When it has left 40 and goes to 400 you see at a glance that the car has travelled 360 miles. If it comes back from 400 to 350, you see it has performed 50 miles. On roads with branches it works just as simply. For instance, if you please, take the Harlem road. If you consider that a part of the New York Central, you might call it H; the Buffalo Division of the Erie road, if that be called a branch, you mark B. In this way the mileage can be made up daily and it will give the location of every car belonging to the company daily, and the mileage of foreign cars can be furnished daily. The Empire line is now using this system, and one can go into the Superintendent's office of the Eastern or Western Division of that line and learn the position of any car in two minutes. The reports can be made up very rapidly, and if once put in working order it would be one of the most valuable adjuncts to any railroad that could be introduced.

As there was no further discussion of this topic, the accompanying reports of wheel service which had been received were presented and the total average mileage of wheels was read.

The following extract from a letter by Mr. Warren Green, the Secretary and Treasurer of the Louisville Car Wheel and Railway Supply Company, addressed to the committee who have the charge of the meetings, was read: "What I would like to call the attention of your body to is our system of guaranteeing wheels, which, being entirely original, may perhaps prove worthy of its consideration."

"A wheel has two values, one for its service as a wheel, another its scrap value. We guarantee as follows: Our 33 in. narrow-tread passenger car wheel weighs about 540 lbs. It is sold for say \$15. Its value as old scrap is say \$5, leaving its wearing value \$10. Now we guarantee every wheel to run 50,000 miles, making its running cost at the rate of 10 cents per mile. Should our wheels be short of their guarantee, we pay promptly in cash whatever shortage there may be. Anything over that is of course the clear gain of the railroad."

THE PRESIDENT.—I have heard nothing said about the mileage of steel-tired wheels yet, as compared with cast-iron chilled wheels. The object at this meeting is to get as nearly as possible the relative cost of service of the two classes of wheels. Most of the gentlemen present have seen a table published in the *Railroad Gazette* which exhibited a statement of the cost per thousand miles of steel-tired and cast iron chilled wheels. With a service of 400,000 miles, the steel wheels cost about the same as the cast iron.

MR. ADAMS asked whether it is known that 30 in. cast-iron wheels will make 40,000 miles under an engine truck.

MR. LOBELLE.—I have here a record of all the wheels taken out on the Philadelphia, Wilmington & Baltimore Railroad. The 26 in. wheels averaged 53,136 miles, the 28 in. 47,581, and the 30 in. 51,731 miles.

MR. ADAMS.—Nothing has been said about the weight which these wheels carry and the speed at which they run. These engine truck wheels may be under light engines, and I am strongly persuaded that the engine truck wheels on the Boston & Albany Railroad do not make that mileage.

MR. CHAMBERLAIN then read the following paper:

WHEEL SERVICE.

Many of the articles in reference to the matter of wheel service have given the public the impression that steel-tired wheels are far more expensive than cast iron, their life being so short and their expense so great that for the same amount of money you get a far greater mileage from the cast-iron wheels. Now, as far as my experience extends, I am sure this is a mistake. I am confident of being able to show the service of the steel-tired wheel in such a favorable light from actual facts and figures, that I hope to be able to convince you that at least there are steel-tired wheels that are equal in point of economy to any cast-iron wheel.

I have for some time past at considerable labor kept an accurate record of the mileage of our wheels, both steel and iron, and have reached the following results: Although not a complete report, as no steel wheels have yet worn out, however it will show the mileage they have already attained. I here present tables showing the miles a steel-tired wheel would have to run to be equal in point of economy to a cast-iron wheel, at their present cost to us.

The actual average mileage of cast-iron wheels on our road has been 35,000 miles; the average miles run per day has been 135, the cast-iron wheels will therefore be worn out in 8 months and 19 days.

Actual cost of one pair cast-iron wheels..... \$30 00
Fitting, handling, etc., established by Master Car Builders..... 2 00
7 per cent. interest 8 months 19 days..... 1 61

Less 2 old wheels..... \$33 61
12 50

Cost for 35,000 miles..... \$21 11
Actual cost of second pair cast-iron wheels..... \$30 00
Fitting, handling, etc..... 2 00
7 per cent. interest for 8 months 19 days..... 2 67

Less 2 old wheels..... \$55 78
12 50

Cost for 70,000 miles..... \$43 28
Actual cost of third pair cast-iron wheels..... \$30 00
Fitting, handling, etc..... 2 00
7 per cent. interest for 8 months 19 days..... 3 79

Less 2 old wheels..... \$79 07
12 50

Cost for 105,000 miles..... \$66 87

Actual cost of fourth pair cast-iron wheels..... \$30 00
Fitting, handling, etc..... 2 00
7 per cent. interest for 8 months 19 days..... 4 96

Less 2 old wheels..... \$103 63
12 50

Cost for 140,000 miles..... \$91 03

Cost of fifth pair cast-iron wheels to run 17,500 miles, or half the average mileage of a cast-iron wheel..... \$12 85

Cost for 157,500 miles to run 2 years 10 months 16 days..... \$103 88

Statement of cost of steel-tired wheels for 2 years 10 months 16 days, to run 157,500 miles, the average miles run per day being the same as for cast-iron wheels.

Actual cost of 1 pair steel-tired wheels..... \$100 00
Fitting, handling, etc..... 2 00

7 per cent. interest for 8 months 19 days, same time as computed for cast iron..... 5 14

Cost for 35,000 miles..... \$107 14

7 per cent. interest for 8 months 19 days, same time as computed for cast iron..... 5 39

Cost of 70,000 miles..... \$112 53

7 per cent. interest for 8 months 19 days, same time as computed for cast iron..... 5 67

Cost for 105,000 miles..... \$118 20

7 per cent. interest for 8 months 19 days, same time as computed for cast iron..... 5 95

Cost for 140,000 miles..... \$124 18

Before reaching the next point, the steel-tired wheels must be turned, as will be shown by our actual average mileage before turning..... 2 50

Cost of turning and changing..... 3 20

7 per cent. interest for 4 months 10 days, same time as computed for cast iron wheels, to complete time and mileage..... \$129 85

Less 2 old steel-tired wheels..... 25 00

Cost for 157,500 miles..... \$104 85

You will see that the cost of steel-tired wheels for 2 years 10 months 16 days, to run 157,500 miles, has been..... 104 85

Cost of cast-iron wheels, for same time and miles run, has been..... 103 88

Therefore there is a difference of only..... 97

This is near enough for all practical calculations.

It is clear, then, that a steel-tired wheel must wear out 4% cast iron wheels to be as cheap.

Now, gentlemen, the question simply is, will the steel-tired wheel run 2 years 10 months 16 days, and make 157,500 miles? If so, it is surely as economical as a cast-iron wheel. If it will do better than this, every mile it makes in addition costs us absolutely nothing. The facts are these:

We have running now on our road 184 steel-tired wheels that have made an average mileage before turning of 140,937 miles.

We have 8 steel-tired wheels taken from the above lot that have made an average mileage from first to second turning of 147,303 miles and are now running on their second turning; total average mileage up to second turning being 288,240 miles.

The balance have not come to second turning as yet. We have also 90 steel-tired wheels now running and not yet out for first turning that have averaged 176,635 miles.

We have 98 other steel-tired wheels now running not having been in as long as the previous lot that have made an average mileage of 123,859 miles.

The total average mileage of the whole lot we hope to be able to give at some future time when they shall have been worn out. But it is evident enough to me from the above figures that the steel-tired wheel will make an average of 140,000 miles before turning and nearly if not quite that number of miles for each turning, and that they can be turned three times sure.

To show you what the cost of cast-iron wheels would be to run the same number of miles as the steel-tired wheels have already averaged up to the end of their first turning, I have made an additional sheet or table. The actual average mileage has been 288,230 miles; but to simplify the matter I have carried the calculations to only 280,000 miles and the result is as follows:

Cost of four pair of cast-iron wheels to run 140,000 miles..... \$91 03

Actual cost of fifth pair cast-iron wheels..... 30 00

Fitting, handling, etc..... 2 00

7 per cent. interest, 8 months 19 days..... 6 20

Less 2 old wheels..... \$129 23
12 50

Cost for 175,000 miles..... \$116 73

Actual cost of sixth pair cast-iron wheels..... \$30 00

Fitting, handling, etc..... 2 00

7 per cent. interest, 8 months 19 days..... 7 49

Less 2 old wheels..... \$156 22
12 50

Cost for 210,000 miles..... \$143 72

Actual cost of seventh pair cast-iron wheels..... \$30 00

Fitting, handling, etc..... 2 00

7 per cent. interest, 8 months 19 days..... 8 85

Less 2 old wheels..... \$184 57
12 50

Cost for 245,000 miles..... \$172 07

Actual cost of eighth pair cast-iron wheels..... \$30 00

Fitting, handling, etc..... 2 00

7 per cent. interest for 8 months and 19 days..... 10 27

Less 2 old wheels..... \$214 34
12 50

Cost of 1 pair steel-tired wheels to run 140,000 miles..... \$124 15

Cost of turning and changing..... 2 50

7 per cent. interest for 8 months 19 days..... 6 37

Cost of running 175,000 miles..... \$133 02

7 per cent. interest for 8 months 19 days..... 6 70

Cost of running 210,000 miles..... \$139 72

7 per cent. interest for 8 months 19 days..... 7 04

Cost of running 245,000 miles..... \$146 76

7 per cent. interest, 8 months 19 days..... 7 39

Value of wheels when worn out..... \$154 15
25 00

Cost of running 280,000 miles..... \$129 15

Difference in favor of steel-tired wheels at the expiration of first turning..... \$73 69

Remember, gentlemen, these wheels are still running.

Some one inquired here whether in estimating the cost of turning the steel wheels Mr. Chamberlain had included anything excepting the cost of labor.

MR. CHAMBERLAIN.—It includes only the cost of labor; nothing more.

Some one asked whether the interest of the money invested in the lathe, etc., used in turning the wheels should not be charged?

MR. CHAMBERLAIN.—That is included in the general expenses.

MR. FORNEY.—Suppose a company that is using cast-iron wheels determines to use steel wheels? It would then be necessary to buy several expensive lathes to turn the tires. Now the interest on that investment is a cost to the company. You say it is charged in the general expenses, but it is nevertheless an extra cost to the company due to the use of steel wheels instead of cast-iron.

MR. ADAMS.—The expense of boring and fitting wheels to their axles is precisely alike, whether they be of steel or cast-iron. They are perfectly equal in every particular except the lathes to turn the treads of the wheels. Now then all you want to do to that, if Mr. Chamberlain has not done it, is to add the interest of the one machine and what it cost to run it. One machine will turn all the wheels that any railroad company needs. Mr. Chamberlain has put down a large price for that work, \$2.50.

MR. FORNEY.—Are the wheels which failed from defects, breakages, etc., included in the 184 wheels which are reported to have averaged 140,937 miles each?

MR. CHAMBERLAIN.—No, sir.

MR. J. L. GILL.—At our shop in Columbus, Ohio, the mileage has been kept of the engine truck and tender wheels for the last two years. During the last six months of 1874 the lowest mileage that had been made by any pair of cast-iron wheels, which cost about \$16.50 apiece—was over 30,000 miles, and some of them ran 96,000 miles. These wheels are made of Hanging Rock charcoal cold-blast metal, and we do not consider that any hot blast can come in competition with it, nor do we feel disposed to let those wheels come into comparison with the cheap \$12 or \$13 wheels that many roads are using. The mileage of these wheels has been kept correctly, so that I do not think the comparison that it will take four, five or six pairs of cast-iron wheels to outrun one pair of steel wheels is correct. I know of some steel-tired wheels which were put on the Hocking Valley Railroad that did not run 70,000 miles and were then so far injured as to be discarded and thrown out of use.

MR. CHAMBERLAIN.—The majority of the cast-iron wheels of which I have given you the average mileage are of Western manufacture and all passenger wheels. The average is made up from 4,137 wheels which were taken out during the last four years.

MR. FORNEY.—The point which I am disposed to cavil about in Mr. Chamberlain's calculation is this: The average mileage of cast-iron wheels on the Boston & Albany Railroad he gives at only 35,000 miles, whereas on the Lake Shore for the past three years it is nearly 50,000 miles, and on the Pennsylvania Railroad during the past year it was nearly 45,000, and during the month of December considerably over 50,000 miles, and is still increasing. Now what is the reason for this very great difference? Can it be true that the Lake Shore and Pennsylvania Railroad companies do not report correctly? If any one will make the same kind of calculation that Mr. Chamberlain has made, he will be surprised to find how the interest account runs up. Now if you substitute 49,901, or say 50,000 miles for 35,000 it will be found that the comparison will be much less favorable for steel wheels.

In the calculation of the cost of service of steel wheels, their value when worn out is given at \$25 per pair. Now is there any one who will pay \$25 for them?

MR. CHAMBERLAIN.—All I can do is to refer you to Mr. Washburn, to whom we sell the old wheels at that price.

MR. FORNEY.—But if you take wheels to Chicago or San Francisco, it would be very expensive to ship them to Hartford, even if you sold them for \$25.

MR. CHAMBERLAIN.—Would it not be just as expensive to ship cast-iron wheels back to the market?

MR. FORNEY.—Yes, but there is a market for old cast-iron wheels in Chicago and most other places, so that it is not necessary to ship them back to the makers, whereas there are no parties that I can learn of in Chicago, or any where else excepting in Hartford, who will buy old steel wheels at \$25 per pair.

MR. CHAMBERLAIN has told us, too, that the 184 steel wheels do not include those wheels in use on his road that failed from defects. Now, has he, in making up the mileage of cast-iron wheels, included those which were defective or were worn flat? If the defective wheels are included in the one case and not in the other, the comparison is not a fair one.

MR. CHAMBERLAIN.—Nothing but fairly worn-out wheels are in the report.

MR. FORNEY.—Then the average mileage of your cast-iron wheels is still worse. It is the wheels which grow flat which reduce the average so low. If the average mileage of 184 wheels reported in the statement before you does not include the defective wheels, it is delusive. I saw only a few days ago at a railroad shop a steel-tired wheel of which about half of the width of the tread was broken out half-way around the circumference of the wheel. Such a defect is not peculiar to steel-tired wheels, but it shows that such failures do occur with them as well as with cast-iron wheels.

MR. CHAMBERLAIN.—The gentlemen are as well aware as I am that the matter of making steel-tired wheels some years ago was a matter of experiment. The principal object at that time was to see whether cast iron could be welded to steel. It was found that it could, and the wheels were made promiscuously. The idea was, that if the wheel was run it would make a steel wheel. They ran across some difficulties before they got through. But these have been overcome so that there is not the liability now of one in a million failing. If in making the ingot for the wheel tire there should be a blow, hole in it, when that is rolled it will make a seam. With the process now employed, it is impossible to get one of these seams.

MR. FORNEY.—It is of course a matter of the very greatest importance that the railroad companies should know whether the steel wheels are cheaper than the cast iron. If the facts given in the statement before you are correct, it shows that the former are much the cheapest; but the facts are the matters in question, and it was to call out these that this meeting is held. Once establish these and we can easily calculate which kind of wheels will be the cheapest. I am not an advocate of cast-iron wheels nor of steel, but of the cheapest wheels.

MR. CLARK FISHER was called upon and said that he was struck with a remark of Mr. Chamberlain's as to the possibility of welding steel and cast iron. His firm have been doing it regularly for the last thirty years. A process was originally invented by Mr. Mark Fisher, his father, who applied it in making anvils. It is the same process that has since been adopted in making car wheels. It consists in heating the steel and afterward washing the steel surface with melted iron. A flux is used in the process. In their case it is more difficult to weld than in the case of car wheels, because they do not harden the wheels afterward. The contraction between steel and cast iron is so great that unless it is perfectly welded you cannot make a perfect article. In a car wheel you do not know whether the metals are perfectly welded or not, because you do not harden it.

MR. DAVENPORT stated that the firm with which he was connected furnished wheels to the Lake Shore Railroad and guaranteed them for 50,000 miles of service, and if they made any less than that they gave a new wheel in the place of the old one.

MR. ADAMS.—Do you mean to say that if a wheel which you furnish makes 48,000 miles and then is unfit for any more service that you get nothing for it?

MR. DAVENPORT.—Yes; that is just what I mean to say. A cast-iron wheel, therefore, that makes only 35,000 miles makes it for nothing. It has been remarked that since our discussion here wheels have improved very much in quality. In 1874 the Lake Shore reported the wheels which had been removed of a certain

You, of course, understood that the first year's wheels don't make a large mileage. The wheels referred to showed a performance that year of a little over 50,000 per year. In 1875, which is spoken of as a remarkably severe year, their general average was over 52,000 miles. In 1876 it was nearly 52,000 miles. I would advise master car-builders to induce their officers to have the mileage of cars taken on their roads at all hazards.

Mr. McWood, of the Grand Trunk road.—Forty-two inch wheels with steel tires have been in service now for about two years on our line, and we have taken out two sets that had run 108,000 miles, and the reason we took them out was that they had run sharp on the flange. An average of less than 3-16 in. was turned off the wheels, reducing their diameter 3/4 in. They are all under Pullman cars; and one thing has suggested

steel, Vickers' and Krupp's. Krupp's will probably give the best satisfaction.

A paper from Mr. Snow and another from Mr. Wallace, of the Grand Trunk road, were read, but the publication of these must be deferred.

General Railroad News.

PERSONAL.

—Mr. R. E. Ricker, late Superintendent and Engineer of the Central Railroad of New Jersey, has entered into partnership with George S. Jones, and purposes going into the general

brother-in-law to Gen. George J. Magee, President of the company.

—Mr. Daniel W. Wyman, Superintendent of the New York Elevated Railroad, died at his residence in Jersey City, Feb. 18, aged 53 years. He had been in poor health for several months. Mr. Wyman was many years in the service of the Erie Railway.

—Mr. Francis S. Lathrop, the Receiver of the Central Railroad of New Jersey, is a gentleman of large means and of extensive business experience. Besides being a lay judge of the New Jersey Court of Errors, he is a member of the Board of Riparian Commissioners and of the Board of Commissioners of the State lunatic asylum at Morris Plains. He is also President of the Union Mutual Insurance Company, of New York, and Treasurer of the Chamber of Commerce of that city.

—Hon. Ginery Twichell, who this year retires from the Boston & Albany board, declining a re-election, has been connected with the road for 29 years, as director and afterwards President of the Boston & Worcester, and director of the consolidated company since its formation.

—Mr. John Cummings has resigned as a State director of the Boston & Albany, having been elected a director by the stockholders last week.

—Col. I. W. Ross has resigned his position as Superintendent of the Boston, Barre & Gardner road on account of ill health.

ELECTIONS AND APPOINTMENTS.

Milwaukee & Dubuque.—At the annual meeting recently the following directors were chosen: H. M. Benjamin, C. W. Smith, H. Palmer, G. Burnham, A. M. Carter, T. H. Judd, L. Auer, M. Field. The board elected H. M. Benjamin, President; C. W. Smith, Vice-President; W. C. Williams, Treasurer; J. H. Stearns, Secretary and Chief Engineer. The offices are in Milwaukee, Wis.

Dubuque Southern.—At the annual meeting in Dubuque, Ia., Feb. 13, the following directors were chosen: I. B. Durant, E. K. Goodenow, John Crerar, James P. Farley, D. Willis James.

Dubuque & Sioux City.—At the annual meeting in Dubuque, Ia., Feb. 13, the following directors (one half the board) were chosen: J. A. Roosevelt, Abram S. Hewitt, J. Pierpont Morgan, Lorenzo Blackstone. The road is leased to the Illinois Central.

St. Joseph & Des Moines.—This company has lately been organized and the following is the first board of directors: James McCord, Charles W. Campbell, George Buell, Rufus L. McDonald, James D. McNeely, Richard E. Turner, William E. Hoesa, Charles D. Smith, Calvin F. Burnes, Able M. Saxton, Willard P. Hall, George W. Samuels, Isaac Weil. The company's office is at St. Joseph, Mo.

United New Jersey.—The New Jersey Legislature has elected Mr. Wm. Patterson State director of this company, in place of Charles A. Butts.

Fort Wayne, Jackson & Saginaw.—At the annual meeting in Jackson, Mich., Feb. 13, the following directors were chosen: P. B. Loomis, E. A. Webster, D. Merriman, W. D. Thompson, W. R. Reynolds, H. H. Smith, Jackson, Mich.; E. O. Grosvenor, Jonesville, Mich.; Joseph Woodhull, Anokla, Mich.; C. A. O. McClellan, Waterloo, Mich.; A. P. Edgerton, John A. Clark, J. H. Bass, S. C. Evans, Fort Wayne, Ind. The board re-elected P. B. Loomis President and General Manager; E. O. Grosvenor, Vice-President; Eugene Pringle, Secretary; R. S. Chapin, Treasurer.

Columbus & Hocking Valley.—Gen. Orlando Smith, of Chillicothe, O., has been appointed General Superintendent, with office at Columbus, O. Gen. Smith was formerly for several years General Superintendent of the Marietta & Cincinnati and is a well known railroad man.

Columbus & Toledo.—Gen. Orlando Smith has been appointed General Superintendent. He will hold the same position on the Columbus & Hocking Valley road also.

Cleveland & Newburg.—At the annual meeting in Cleveland, O., Feb. 15, the following directors were chosen: A. R. Mitchell, J. A. Manchester, N. P. Bowler, R. Riblet, M. M. Jones, W. P. Case, O. D. Ford.

Mr. Wm. L. Bowler has lately been appointed Receiver of the road.

Atlantic & Pacific Telegraph.—At a meeting held in New York, Feb. 19, Messrs. C. J. Osborn, S. M. Mills, J. D. Smith, Wm. H. Guion and A. B. Chandler resigned and the following directors were chosen in their places: Thomas A. Scott, Philadelphia; John W. Garrett, Baltimore; Hugh J. Jewett, C. K. Garrison, New York; James B. Keene, San Francisco. Messrs. Scott, Garrett and Jewett are well known as the Presidents of the Pennsylvania, the Baltimore & Ohio and the Erie; Mr. Garrison is President of the Missouri Pacific and Mr. Keene is a wealthy stock operator.

West Jersey.—At the annual meeting in Camden, N. J., Feb. 13, the following directors were chosen: Coleman F. Leaming, Cape May Court House, N. J.; Lewis Mulford, Millville, N. J.; John M. Moore, Clayton, N. J.; Charles E. Elmer, Salem, N. J.; Thomas Jones Yorke, Thomas H. Dudley, Alexander G. Cattell, Camden, N. J.; Strickland Kneass, Josiah Bacon, George B. Roberts, George Wood, J. N. Du-Barry, N. Parker Shortridge, Philadelphia. The only new director is Mr. Shortridge, who replaces Samuel A. Whitney. The board re-elected George B. Roberts President; Wm. Taylor, Secretary and Treasurer.

Connecticut Railroad Commission.—The Connecticut Senate has confirmed Mr. George M. Woodruff as Railroad Commissioner. He has been a member of the board several years.

Fall River.—Mr. J. J. Ackley has been appointed Superintendent, in place of Charles E. Barney, resigned.

Pittsfield & North Adams.—At the annual meeting in Boston, Feb. 14, the following directors were chosen: Chester W. Chapin, Wm. Bullard, Wm. M. Tucker, Frederick H. Bradlee, Edward Jackson. The road is leased to the Boston & Albany.

Atlantic & Gulf.—At the annual meeting in Savannah, Ga., Feb. 14, the following directors were chosen: John Screven, Wm. Duncan, C. E. Groover, Henry Lathrop, Edward Lovell, Alfred Haywood, Julian Hartridge, D. G. Purse, R. H. Hardaway, A. T. McIntyre, W. J. Young, C. J. Munnerlyn, W. O. Fleming. There is no change from last year.

Lowell & Andover.—At the annual meeting in Lowell, Mass., Feb. 14, the following directors were chosen: J. C. Ayer, G. V. Fox, H. J. Adams, E. M. Sargeant, George Ripley, Josiah Gates, Frederick Ayer, Jacob Nichols, A. P. Bonney, Benjamin Walker. The board elected Frederick Ayer President; Benjamin Walker, Clerk and Treasurer. The road is leased to the Boston & Maine.

Summit Branch.—At the annual meeting in Philadelphia, Feb. 13, the following directors were chosen: Thomas A. Scott, George B. Roberts, A. J. Cassatt, Wistar Morris, Jacob P. Jones, N. Parker Shortridge, Strickland Kneass, Thomas J. Lee, George Snell, Jacob Edwards. The *Lykens Valley Company*, whose property is leased to the Summit Branch Company, met on the same day and elected the same directors.

Boston, Barre & Gardner.—Mr. Henry M. Witter, of Worcester, Mass., has been appointed Treasurer in place of I. W. Ross, resigned.

Lake Shore & Michigan Southern.—Mr. J. T. R. McKay is appointed Third Assistant General Freight Agent, with headquarters at Cleveland, Ohio. He will have charge of all mat-

PENNSYLVANIA RAILROAD WHEEL RECORD, YEAR 1876.

Annual Statement of Passenger Car-Wheels Drawn During 1876.

Defect.	Class.	Name.	Pullman 33".			Passenger 33".			Passenger 30".		
			No.	Total mileage.	Average.	No.	Total mileage.	Average.	No.	Total mileage.	Average.
Shelled out..... Chill..... Falling..... (Seams.....)	Class I.		223	14,628,698	65,586	484	23,888,307	49,356	40	1,548,427	38,711
			18	987,524	54,862	41	1,678,043	40,928	20	624,270	31,214
			9	489,081	58,676	12	599,303	49,934	1	79,280	79,280
Worn flange..... Worn flat..... Worn hollow at flange..... Worn hollow on tread.....	Class II.	Worn on Rail.	186	12,091,336	65,007	285	15,689,210	55,056	29	1,078,171	37,178
			109	5,813,146	53,332	147	6,203,983	42,204	36	1,249,173	34,699
			32	1,840,808	57,525	35	1,890,091	54,020	21	899,062	42,812
			53	3,480,503	65,670	99	5,492,732	55,482	34	1,325,221	38,977
Burst..... Broken flange or rim..... Cracked plate.....	Class III.	Broken.	9	172,385	19,154	17	439,481	25,852	1	16,555	16,555
			2	63,046	31,523	18	402,877	22,382	.....	.....	.....
			4	204,045	51,011	10	304,927	30,493	.....	.....	.....
Cracked brackets..... Worn hub.....	Class IV.	Other Defects.	1	84,995	84,995	.....	Burnt.....	.....	.....	.....	.....
			2	101,725	50,863	3	254,835	84,945	.....	.....	.....
Flat sliding.....	Class V.		117	3,291,699	28,134	539	10,164,865	18,859	175	3,893,913	22,251
Good for passenger..... Good for freight.....	Class VI.	Good.	268	10,943,771	40,834	512	14,099,456	27,538	121	3,320,250	27,440
			283	16,903,642	59,197	385	13,827,485	36,177	118	3,707,305	31,418
Class I..... " II..... " III..... " IV..... " V..... " VI.....	Totals.		250	16,096,303	64,385	537	26,165,653	48,726	61	2,251,977	36,918
			380	23,225,793	61,121	566	29,276,616	51,726	100	4,551,627	37,930
			15	439,475	29,298	45	1,147,285	25,495	1	16,555	16,555
			3	186,720	62,240	3	254,835	84,945	.....	.....	.....
			117	3,291,699	28,134	539	10,164,865	18,859	175	3,893,913	22,251
			551	26,847,413	48,725	897	27,926,941	31,134	289	7,027,555	24,404
Total mileage wheels flat sliding.....			117	3,291,699	28,134	539	10,164,865	18,859	175	3,893,913	22,251
Total mileage of all wheels drawn.....			1316	10,087,404	53,258	2587	94,936,195	36,697	596	17,741,627	29,768
Total mileage of all wheels drawn except those good for service.....			765	43,239,991	56,523	1690	67,009,254	39,650	357	10,714,072	30,011
Total mileage of wheels worn out.....			648	39,948,292	61,649	1151	66,844,339	49,387	182	6,820,159	37,473

PENNSYLVANIA RAILROAD WHEEL RECORD, DECEMBER, 1876.

Statement of Passenger Car Wheels Drawn During December, 1876.

Defect.	Class.	Name.	Pullman 33".			Passenger 33".			Passenger 30".		
			No.	Total mileage.	Average.	No.	Total mileage.	Average.	No.	Total mileage.	Average.
Shelled out..... Chill..... Falling..... (Seams.....)	Class I.		16	1,236,453	77,278	46	2,753,297	59,864	10	474,547	47,454
			2	139,172	69,586	1	66,516	66,516	.....	.....	.....
		
Worn flange..... Worn flat..... Worn hollow at flange..... Worn hollow on tread.....	Class II.	Worn on Rail.	26	1,872,558	72,021	50	3,299,541	65,991	8	429,195	53,649
			1	51,379	51,379	10	401,653	40,165	2	74,782	37,391
			6	304,508	50,751	2	166,824	83,412	6	312,864	52,144
			13	874,570	67,275	15	989,149	65,943	6	338,145	56,357
Burst..... Broken flange or rim..... Cracked plate.....	Class III.	Broken.	.....	.....	.....	.....	.....	.....	.....	.....	.....
		
		
Cracked brackets..... Worn hub.....	Class IV.	Other Defects.	.....	.....	.....	.....	.....	.....	.....	.....	.....
		
Flat sliding.....	Class V.		12	420,668	35,057	58	1,243,929	21,447	17	402,066	23,651
Good for passenger..... Good for freight.....	Class VI.	Good.	24	1,145,304	47,721	41	2,010,188	49,029	2	85,720	42,860
			16	991,337	61,959	16	670,403	41,900	23	909,623	39,549
Class I..... " II..... " III..... " IV..... " V..... " VI.....	Totals.		18	1,375,625	76,424	47	2,819,813	59,996	10	474,547	47,454
			46	3,103,015	67,457	77	4,857,167	63,090	22	1,154,986	52,499
		
		
			12	420,668	35,057	58	1,243,929	21,447	17	402,066	23,651
			40	2,136,641	53,416	57	2,680,561	47,028	25	995,343	39,814
Total mileage wheels flat sliding.....			12	420,668	35,057	58	1,243,929	21,447	17	402,066	23,651
Total mileage of all wheels drawn.....			116	7,035,549	60,655	240	11,607,083	48,363	74	3,026,942	40,904
Total mileage of all wheels drawn except those good for service.....			76	4,899,408	64,466	183	8,926,492	48,779	49	2,031,599	41,461
Total mileage of wheels worn out.....			64	4,478,740	69,979	125	7,682,563	61,461	32	1,629,533	50,923

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY REPORT OF MILES RUN BY 33-IN. WHEELS UNDER PASSENGER EQUIPMENT. 1876.

MAKER.	Wheels.	Cause of removal.	Total.	Greatest.	Least.	Average.	General average.	New wheels put under.
A.....	1,247	Worn out.	63,701,677	124,364	7,548	51,084	.....	.....
B.....	49	Broken tread.	1,506,144	48,593	530	30,778	.....	.....
C.....	26	Flat (Bad chill or crumbled tread.)	530,649	39,482	4,505	20,409	49,544	1,881
D.....	2	Sharp flange.	23,956	13,780	10,176	11,978	.....	.....
E.....	9	Broken tread.	277,619	46,573	28,905	30,846	.....	.....
F.....	292	Worn out.	17,887,722	114,425	5,181	61,259	.....	.....
G.....	3	Broken tread.	57,048	26,550	7,893	19,616	.....	.....
H.....	2	Broken flange.	83,522	41,761	41,761	41,761	60,369	333
I.....	4	Broken plate.	142,905	48,950	6,957	35,726	.....	.....
J.....	71	Worn out.	3,245,148	112,693	17,531	45,706	45,706	2
K.....	192	Worn out.	11,915,727	161,418	22,712	62,061	61,680	312
L.....	9	Broken tread.	50,219	26,608	23,611	25,109	.....	.....
Total	1,899		99,424,336	.....	.....	.....	52,356	2,528

Average mileage of 33-in. wheels for three years.

MAKER.	1874.	1875.	1876.	Total average for three years.
A.....	55,214	43,199	49,544	48,504
B.....	54,170	50,948	60,369	55,341
C.....	48,434	42,719	45,706	41,862
D.....	50,574	52,434	61,980	56,402
Total average all makers	53,431	44,723	52,356	49,901

ters relating to the rates, movement and claims on account of local freights, and all communications concerning local freight should be addressed to him.

California Transportation Commission.—Mr. Abram B. Venable, of San Francisco, has been appointed Secretary of the Commission, in place of Walter M. Phillips, resigned.

Delaware, Lackawanna & Western.—At the annual meeting in New York, Feb. 20, the old board of managers was re-elected, as follows: John Briabin, James Blair, Scranton, Pa.; John I. Blair, Blairstown, N. J.; Alfred L. Dennis, Newark, N. J.; Wm. Walter Phelps, Teaneck, N. J.; George Bulkley, Southport, Conn.; Simeon B. Chittenden, Brooklyn, N. Y.; George Bliss, Benjamin G. Clarke, Wm. E. Dodge, Wilson G. Hunt, Marcellus Massey, Percy R. Pyne, Samuel Sloan, Moses Taylor, New York. The Board re-elected Samuel Sloan, President; Andrew J. Odell, Secretary; Frederick H. Gibbens, Treasurer.

Wabash.—The office and address of the Division Superintendent, Eastern Division, was removed to Fort Wayne, Ind., Feb. 15.

Springfield & New London.—The new board has elected Gordon Bill, President; L. J. Powers, Vice-President; Daniel L. Harris, Clerk; James Kirkham, Treasurer.

Battleboro & Whitehall.—The organization has been completed by the election of the following officers: President, W. H. Cooke, Whitehall, N. Y.; Vice-President, A. C. Howard, Townshend, Vt.; Clerk and Treasurer, John A. Butler, Jamaica, Vt.

Consolidation Coal.—At the annual meeting in New York, Feb. 21, the following directors were chosen: Charles F. Mayer, Robert Garrett, Galloway Cheston, W. F. Barnes, Wm. White, George B. Warren, Jr., E. R. Bell, D. W. Bishop, E. P. Fabbri, J. Hoodwright, Robert Winthrop. The board is almost entirely new, Mr. Garrett being the only director re-elected. The board chose Charles F. Mayer President, in place of Allan Campbell. The company owns the Cumberland & Piedmont Railroad.

Joplin.—At the annual meeting in Girard, Kan., Feb. 2, the old officers were re-elected as follows: President, E. R. Moffet; Vice-President, F. Playter; Secretary, W. A. Botkin; Treasurer, J. B. Sergeant; Auditor, J. A. Hardin; Superintendent, E. H. Brown.

ANNUAL REPORTS.

Delaware & Hudson Canal.

This company owns a canal from Honesdale, Pa., to Rondout, N. Y., 108 miles; a railroad from Carbondale, Pa., to Mill Creek, 31.55 miles, with 34.35 miles of coal branches; the Lackawanna & Susquehanna road, from Jefferson Junction, Pa., to Nineveh, N. Y., 21.71 miles, and the New York & Canada road, from Whitehall, N. Y., to Rouse's Point, 113 miles, with branches from West Chazy to Mow's Junction, 10 miles, from Plattsburg to Ausable Forks, 20 miles, and to Lake George, 4 miles. The whole property owned consists of 108 miles of canal and 234.61 miles of railroad, besides a very large investment in coal lands and mines. The New York & Canada is nominally an independent corporation, but the Delaware & Hudson owns all the stock. The other roads are owned directly. The company also leases the Rensselaer & Saratoga road, a main line from Albany, N. Y., to Rutland, Vt., 101.5 miles, with branches from Ballston to Schenectady, 15 miles; from Fort Edward to Glenn's Falls, 5.76 miles, and from Eagle Bridge, N. Y., to Castleton, Vt., 60.15 miles, making 182.41 miles in all; and the Albany & Susquehanna road, from Albany to Binghamton, 142 miles, with branches to Schenectady, 15 miles, and to Cherry Valley 22 miles, making 179 miles in all. The latest report is for the year ending Dec. 31, 1876.

The credit side of the capital account is as follows:

Capital stock	\$20,000,000 00
Funded debt	15,116,000 00
Sinking fund, Boston, Hartford & Erie bonds	274,545 19
January interest and dividends	760,765 90
December bills, payable in January	672,590 71
Taxes payable in January	67,833 84
Depositors	634,318 99
Dividends and interest unclaimed	35,721 80
Bills payable	865,000 00
General profit and loss	1,048,323 76
Total	\$39,285,099 89

The assets include, besides the canal owned, charged at \$6,339,210.49; the railroad, charged at \$6,195,511.87; real estate at \$8,532,873.35; mine property, \$2,666,849.05; Lackawanna & Susquehanna road, \$1,021,153.45; boats, steam-tugs, coal-yards, supplies on hand and similar property, \$300,000 Rhinebeck & Connecticut bonds, \$103,050 Jefferson bonds, \$1,254,268.83 Boston, Hartford & Erie guarantee bonds, \$420,000 Albany & Susquehanna bonds and \$900,000 stock, \$750,912.50 Rensselaer & Saratoga stock and \$3,597,086.51 New York & Canada stock, of which \$4,000,000 is represented by stock, \$4,000,000 by bonds and the balance by advances of the Delaware & Hudson Company.

The general statement for the year is as follows:

Sales of coal	\$6,495,427 69
Canal tolls	43,444 59
Miscellaneous earnings of railroads in Pennsylvania	306,911 42
Interest on investments	338,932 43
Miscellaneous profits	381,047 81
Coal on hand Dec. 31, 1876, 240,322 tons	698,758 15
Total	\$8,264,522 09

Coal on hand Dec. 31, 1876, 240,322 tons	\$737,827 35
Coal purchased	120,599 47
Mining coal	2,754,778 20
Coal transportation and repairs	542,155 54
Freight of coal and canal expenses	1,032,430 79
Rondout expenses	142,755 38
Freight paid other lines	428,839 53
Harbor and yard expenses	59,861 74
Taxes	221,177 69
Salaries, rents and miscellaneous	172,984 04
Interest	1,187,886 07
Loss on leased lines	555,408 90
Total	7,956,501 90

Balance, profit	\$308,020 19
The statement for the 508 miles of leased roads is as follows:	
Passenger	\$872,067 27
Freight	1,594,816 25
Express and mail	95,298 62
Miscellaneous	77,290 82
Cherry Valley Branch	23,766 94
Champlain earnings	390,438 09
Total	\$3,064,677 69
Working expenses and taxes	2,004,249 31
Net earnings	\$1,060,428 38
Interest, rentals and dividends	1,613,834 28
Deficit for the year	\$553,405 90

President Dickinson's report is as follows: "The board of managers herewith submit to the stockholders the annual statement of the business of the company for the year ending Dec. 31, 1876. "The results, although disappointing when compared with those of the previous year, cannot, under the changed circumstances, properly be considered as unsatisfactory.

"Not only was the coal tonnage largely decreased in volume, but the average price per ton was much below that of 1875. The gross earnings of the railroads were also less; but, owing to a decrease in the operating expenses, the net results were fully maintained.

"The New York & Canada Railroad has been completed, and the entire line was opened about the 1st of September. The business upon this road has realized our expectations, and justifies the belief that, when the ore and iron interests resume their wonted activity, this road will be self-sustaining, and, beyond this, as a feeder to the Rensselaer & Saratoga and the Albany & Susquehanna roads, will largely increase their revenues.

"In the present condition of the coal trade it would be idle to speculate upon the results of the business for the current year, for so long as the capacity of the anthracite region is pushed to its full extent, and the quantity of coal mined and forwarded to market is largely in excess of the requirements for consumption, just so long must the business continue to be unprofitable. In 1852 the production of anthracite coal was 4,925,000 tons; in 1862 it was 7,482,000 tons, showing an increase of 50 per cent. The demand steadily increased until 1873, when the production reached 21,689,000 tons, an increase in eleven years of nearly 30 per cent.

"In 1874 the production was 19,805,000 tons, a decrease of 9 per cent. In 1875, 20,643,000 tons, a gain of 4 per cent.; and in 1876, 19,906,000 tons, a decrease of about 9 per cent.

"The large increase of consumption during the decade 1860-1870 was doubtless in large degree the result of the exigencies of the war, and the demand for coal became so great that the companies engaged in the trade were compelled, in order to meet it, to acquire new lands, open mines and secure new avenues to market.

"At the present time it is safe to say that the aggregate productive capacity of the anthracite region is not less than 30,000,000 tons, and until the natural increase of consumption calls for such full production the practical relief to the trade would seem to be an arrangement proportionating the supply to the demand.

"Meanwhile your managers, in the exercise of their best judgment, are looking to the care and preservation of the property. To this end the most rigid economy is being observed in every department, and a marked decrease in the cost of coal and general expenses has already been attained.

"As a matter of record, and for the purpose of comparison in showing how exceptionally low the price of coal is, it may be stated that the average quotation of stove coal from 1853 to 1862, both inclusive, was about \$4.25 per ton. This was a period the least remunerative the trade had encountered, and one during which the wages of miners were at least 40 per cent. below the present rates.

"The record of the company in the past is the strongest evidence of the intrinsic value of its property. For a period of years it has paid to its stockholders regular dividends, besides largely reducing from time to time the cost value of its lands, and other acquisitions, upon the books, so that to-day your coal lands are represented by figures which do not show one-third of their fair market value, and the managers have no hesitation in saying that at no period in the history of the company has its property been in as good order and condition as now.

"The policy that led to the acquisition of the leased lines has been severely criticised, and the results of such policy grossly misstated. This branch of the business will be found separated from that of the company proper, so as to show the net results in operating the leased lines, apart from the profits on coal. In this connection it should be remembered that, prior to the acquisition of those lines, the only outlet for our coal was by canal, from the mines to Rondout, on the North River. This outlet could only be used during eight months of the year, and we were practically cut off from the winter market.

"The opening of the Albany & Susquehanna Railroad connected the mines with Northern New York, and reached our best and most reliable market at all seasons. It was at once demonstrated that those manufacturers and dealers who had previously laid in their coal during the season of navigation were attracted to this new avenue of supply, and your managers were forced to the conclusion that the possession of this road was a necessity, unless they were willing to see it in the hands of rival interests, who, with a small amount of coal, could demoralize our trade and control the price of almost our entire product.

"The finances of the company are in a sound condition, and the attacks that have been made upon its credit are wholly unwarranted. The managers can only express their regret if any stockholders have sacrificed their property under the influence of apprehension caused by adverse rumors which were entirely without foundation in fact. In concluding this report it may be added, for the purpose of enabling the stockholders to form their own estimate of the value of their property, that the fixed annual charges, including interest and rentals and dividends upon leased lines, do not exceed \$3,000,000. The receipts applicable to their payment, and entirely exclusive of any profit on coal, are fully \$2,000,000.

"If the past record of the company and its present position avail anything, the above statement should allay anxiety, affording as it does strong grounds for the belief that your investment possesses points of strength at least equal to any whose prosperity depends in any measure upon the marketing of coal."

Boston & Albany.

During the fiscal year ending Sept. 30, 1876, this company worked the following lines:

Miles.	
201.65	Main Line, Boston, Mass., to Albany, N. Y.
9.30	Grand Junction Branch, Brighton, Mass., to East Boston
1.85	Brookline Branch, Boston to Brookline
1.10	Newton Lower Falls Branch, Newton, Mass., to Newton Lower Falls
3.70	Saxonville Branch, Natick, Mass., to Saxonville
12.00	Milford Branch, South Framingham, Mass., to Milford
3.00	Milbury Branch, Milbury Junction, Mass., to Milbury
17.33	Hudson Branch, Chatham, N. Y., to Hudson
249.63	Total owned
18.85	Pittsfield & North Adams, leased, Pittsfield Junction, Mass., to North Adams
49.00	Ware River R. R., leased, Gilbertville, Mass., to Winchendon
67.65	Total worked

The equipment consists of 239 engines and 9 snow-plows; 190 passenger and 54 baggage and postal cars; 4,562 freight and 509 other cars. It was increased during the year by 24 passenger and 7 baggage and postal cars.

The general account at the close of the year was as follows:

Stock (\$80,119 per mile)	\$20,000,000 00
Boston & Albany 7 per cent. bonds	5,000,000 00
Boston & Albany 6 per cent. bonds	2,000,000 00
Albany City bond	1,000 00
Total funded debt (\$28,046 per mile)	7,001,000 00
Unclaimed dividends and interest	38,925 00
November dividends and January rentals	836,000 00
Notes payable	832,013 37
Reserved fund	3,000,000 00
Contingent fund	692,396 53
Total (\$129,753 per mile)	\$32,400,395 20

The road and equipment is charged at \$28,821,762.28, or \$115,458 per mile; South Boston property, \$505,088.22; interest in Hudson River bridges, \$475,485; real estate, \$119,678.86. The Albany sinking fund amounts to \$30,826.22; materials on hand \$1,396,041.07, cash \$638,501.14. The only securities owned are \$13,000 West Stockbridge stock.

The work done was as follows:

1876-77.	1875-76.	Inc. or Dec.	P. c.
Train mileage, passen'gr.	1,420,547	1,387,240	Inc. 33,307 2.4
" " freight	3,477,073	3,438,676	Inc. 38,397 1.1
" " service	85,660	83,490	Inc. 2,170 2.7
Total	4,983,280	4,909,216	Inc. 74,064 1.5
Pass. carried, through	69,699	66,261	Inc. 3,438 5.2
" " local	5,513,653	5,898,216	Dec. 384,563 6.9
Total	5,583,352	5,964,477	Dec. 381,125 6.8
Passenger mileage	110,644,410	119,720,918	Dec. 9,076,508 7.6
Tons carried, through	833,288	743,130	Inc. 90,158 10.7
" " local	1,708,006	1,696,343	Inc. 11,664 0.7
Total	2,541,294	2,439,473	Inc. 101,821 4.0
Tonnage mileage	301,624,988	282,309,799	Inc. 19,315,189 6.5
Average cost per ton or passenger per mile	0.956 cts.	1.114 cts.	Dec. 0.158 cts. 16.3
Average passenger train load, No.	77.89	86.30	Dec. 8.41 9.7
Average freight train load, tons	86.63	82.10	Inc. 4.53 5.5

The number of barrels of flour from Albany to Boston was 1,024,784; to other points, 836,280; total, 1,861,064, being a decrease of 10,523 barrels to Boston and an increase of 77,562 to other points. The earnings for the year were as follows:

1876-77.	1875-76.	Inc. or Dec.	P. c.
Passengers	\$2,626,692 50	\$2,972,454 65	Dec. \$345,762 15 13.6
Freight	3,886,131 64	4,328,130 74	Dec. 441,997 10 10.3
Mails and other sources	561,934 30	569,308 12	Dec. 7,373 82 1.3
Total	\$7,074,758 44	\$7,869,953 51	Dec. \$795,195 07 10.1
Repairs of road	912,599 49	1,091,196 08	Dec. 178,596 59 19.4
Repairs of engines	282,730 35	306,022 95	Dec. 23,292 60 7.6
Repairs of cars	478,990 71	554,787 20	Dec. 75,796 49 13.7
Repairs of buildings	80,684 82	107,172 31	Dec. 26,477 79 24.7
Transportation expenses	2,816,916 00	3,188,786 83	Dec. 371,870 83 13.2
General expenses	111,072 97	123,967 51	Dec. 12,894 54 10.4
Total	\$4,682,994 04	\$5,371,902 88	Dec. \$688,908 84 12.8
Net earnings	\$2,391,764 40	\$2,498,050 63	Dec. \$106,286 23 4.3
Gross earnings per mile	22,298 15	24,804 00	Dec. 2,505 85 10.1
Net earnings per mile	7,538 34	7,873 00	Dec. 334 66 4.3
Per cent. of expenses	66.19	68.26	Dec. 2.07 3.0

The income account was as follows:

Net earnings	\$2,391,764 40
Dividends, 9 per cent.	\$1,800,000 00
Interest	490,955 76
Pittsfield & North Adams rental dividends	27,000 00
Ware River	45,000 00
Total	2,362,355 16
Surplus for the year	\$28,806 44
Premium on bonds	30,000 00
Surplus at commencement of year	3,633,589 19
Total surplus	\$3,692,395 63

President Chapin's report says: "The general depression which during the last three years has settled upon all the industries of the country, aggravated in railroad business by the wildest competition ever known, has carried the rate on through traffic far below the dreams of the most visionary advocate of cheap transportation. The varying and oftentimes utterly discordant theories upon which the managing men of our great trunk lines claim to act in fixing transportation rates constitute one of the chief obstacles in the way of a return to a healthy and prosperous business. Thus, while one claims because his route is the longer he must charge so much the less, as an inducement to the shipper to leave the most direct route, the short route, on the contrary, contends that the actual mileage is the only element to be considered in ascertaining the cost of transportation, and so reduces prices to suit this theory.

"While it is true that freight can be carried five hundred or a thousand miles, over an equally favorable road, at a less rate per ton per mile, than for one or two hundred miles, the handling being the same, and the time the car is in use varying but little, it must also be admitted that the element of grades and curvatures is often more essential than the distance. Thus one road 20 per cent. shorter in miles may, from its higher grades, require 30 per cent. more power to transport a given quantity of freight over its line.

"It may well be doubted whether the extremely low and uncertain prices at which merchandise is now being transported, under the conflicting views of different managers, has worked any advantage to the patrons of the roads. Certain it is that it can only work injury and, if continued long enough, destruction to railroad property.

"It is confidently hoped that the owners and managers of our railroads are beginning to appreciate the folly of this profitless warfare, and by reasonable concessions to the claims and theories of each other, will so readjust the rates of transportation as to make the railroad business what it should be, one of the sure and profitable sources of revenue in this country.

"By reference to tables A, B, C and D it will be perceived that notwithstanding the large falling off in gross receipts the past year, we are yet doing substantially the same amount of work as in the most prosperous times. That we have been able to continue this, and at the same time meet the reasonable expectations of our stockholders, is due, as we remarked in our last year's report, 'in no small measure, to the larger accumulation of surplus profits, which have been from time to time invested in substantial additions to the property of the corporation.'

"We have paid and canceled during the past year the last of the Western Railroad dollar bonds, and have also extinguished the Albany city debt, and with the exception of a single bond of \$1,000, the bonds have all been returned to the city of Albany and destroyed. The Albany sinking fund has yielded us a surplus of about \$30,000.

"The union passenger station at Worcester and the approaches thereto have been entirely completed during the year. The Board of Railroad Commissioners have now under consideration the question of rent to be paid by the other railroads, and it is expected within a few weeks they will all come there with their passenger business. This will afford a considerable source of revenue of which, from the magnitude and duration of the work, we have been for several years deprived.

"Ample and commodious yards and buildings for the transaction of the live stock business have been completed at Brighton, which will also become a source of revenue to us in the future.

"The damage caused by the breaking away of the Worcester reservoir has also been entirely repaired, and compensation therefor agreed upon with the city authorities of Worcester. The money will be paid over and the case satisfactorily settled within a few days.

"The track equipment of the road has had unremitting care and attention during the past year. Nine new locomotives

The road and equipment is charged at \$28,821,762.28, or \$115,458 per mile; South Boston property, \$505,088.22; interest in Hudson River bridges, \$475,485; real estate, \$119,678.86. The Albany sinking fund amounts to \$30,826.22; materials on hand \$1,396,041.07, cash \$638,501.14. The only securities owned are \$13,000 West Stockbridge stock.

The work done was as follows:

1876-77.	1875-76.	Inc. or Dec.	P. c.
Train mileage, passen'gr.	1,420,547	1,387,240	Inc. 33,307 2.4
" " freight	3,477,073	3,438,676	Inc. 38,397 1.1
" " service	85,660	83,490	Inc. 2,170 2.7
Total	4,983,280	4,909,216	Inc. 74,064 1.5
Pass. carried, through	69,699	66,261	Inc. 3,438 5.2
" " local	5,513,653	5,898,216	Dec. 384,563 6.9
Total	5,583,352	5,964,477	Dec. 381,125 6.8
Passenger mileage	110,644,410	119,720,918	Dec. 9,076,508 7.6
Tons carried, through	833,288	743,130	Inc. 90,158 10.7
" " local	1,708,006	1,696,343	Inc. 11,664 0.7
Total	2,541,294	2,439,473	Inc. 101,821 4.0
Tonnage mileage	301,624,988	282,309,799	Inc. 19,315,189 6.5
Average cost per ton or passenger per mile	0.956 cts.	1.114 cts.	Dec. 0.158 cts. 16.3
Average passenger train load, No.	77.89	86.30	Dec. 8.41 9.7
Average freight train load, tons	86.63	82.10	Inc. 4.53 5.5

The number of barrels of flour from Albany to Boston was 1,024,784; to other points, 836,280; total, 1,861,064, being a decrease of 10,523 barrels to Boston and an increase of 77,562 to other points. The earnings for the year were as follows:

1876-77.	1875-76.	Inc. or Dec.	P. c.
Passengers	\$2,626,692 50	\$2,972,454 65	Dec. \$345,762 15 13.6
Freight	3,886,131 64	4,328,130 74	Dec. 441,997 10 10.3
Mails and other sources	561,934 30	569,308 12	Dec. 7,373 82 1.3
Total	\$7,074,758 44	\$7,869,953 51	Dec. \$795,195 07 10.1
Repairs of road	912,599 49	1,091,196 08	Dec. 178,596 59 19.4
Repairs of engines	282,730 35	306,022 95	Dec. 23,292 60 7.6
Repairs of cars	478,990 71	554,787 20	Dec. 75,796 49 13.7
Repairs of buildings	80,684 82	107,172 31	Dec. 26,477 79 24.7
Transportation expenses	2,816,916 00	3,188,786 83	Dec. 371,870 83 13.2
General expenses	111,072 97	123,967 51	Dec. 12,894 54 10.4
Total	\$4,682,994 04	\$5,371,902 88	Dec. \$688,908 84 12.8
Net earnings	\$2,391,764 40	\$2,498,050 63	Dec. \$106,286 23 4.3
Gross earnings per mile	22,298 15	24,804 00	Dec. 2,505 85

have been substituted for a like number of old ones, 12 passenger and 123 freight cars have been added, and 2,500 tons of steel rails have been purchased and laid in the track, all of which have been charged to the current expenses of the year.

"The road, depots, shops, and machinery have been carefully examined and found in most excellent order, and we were never in so good a condition to do a large business as at the present day."

Delaware, Lackawanna & Western.

At the annual meeting in New York, Feb. 20, the following partial statement for the year ending Dec. 31, 1876, was made public. The capital account at the close of the year was as follows, as compared with 1875:

	1876.	1875.
Capital stock.....	\$26,200,000 00	\$25,899,000 00
Convertible mortgage bonds.....	\$1,633,000	
Convertible bonds.....	600,000	
Lackawanna & Bloomsburg bonds.....	587,100	
Total funded debt.....	2,820,100 00	2,831,100 00
All other liabilities, including int'l and rentals to Jan. 1.....	\$4,281,555 75	
Less cash, bills and accounts receivable, coal on hand and advances on coal.....	3,401,240 02	
Surplus reserved.....	880,315 73	5,801,612 82
Total.....	\$35,113,853 51	

Assets:
Construction and property accounts.....\$29,118,248 46 \$27,871,799 61
Real estate in New York, Rochester, Buffalo and Chicago.....335,536 36
Stock and bonds valued at.....4,383,837 46 3,805,738 75
Barges and equipment.....66,581 72
Materials on hand, at cost.....1,209,650 51 1,153,142 87
Total.....\$35,113,853 51

The capital account last year was stated in a somewhat different form, which prevents comparison except as to the principal items. The property represented by the construction and property accounts consist of 195 miles of main line of railroad, of which more than 197 miles is double track, making 392 miles of main track, of which 195 miles are laid with steel; over 70 miles of lateral railroads; 153 locomotives and 16,965 cars; machine and car shops with machinery and fixtures; 15,000 acres of selected coal lands, in fee, upon which the improvements have cost over \$3,000,000, and which have a capacity to produce 4,000,000 tons of coal annually. The company also hold under lease, at low rentals, 4,000 acres of coal lands.

The net result of the operations of the year is given as follows:

Net earnings from all sources.....	\$4,001,861 46
Interest on bonds and rentals on all leased lines.....	3,280,036 50
Net surplus.....	\$721,824 96

As compared with 1875 the net earnings from all sources show a decrease of \$3,160,322.41, or 44.1 per cent.; with 1874, a decrease of \$1,741,889.08, or 30.3 per cent. The net surplus for the year was 2.76 per cent. on the capital stock.

THE SCRAP HEAP.

Railroad Manufactures.

Kellogg & Maurice, at Athens, Pa., have just completed two double-track iron bridges for the Pennsylvania & New York road, one of two spans of 115 feet each over the Lackawanna River, near Pittston, Pa., and one of two spans of 161 feet each over Funkhannock Creek. They are now at work on five spans, 105 feet each, of double-track iron bridge to cross the Lehigh River at White Haven, for the Lehigh Valley road.

Mr. George Douglas is adding to his steam forge at Bridgeport, Conn., a 40-horse power engine, with the necessary boilers. He is at present at work on heavy orders for pump-rod for oil wells.

The Leighton Bridge & Iron Works, at Rochester, N. Y., have just received orders from the Boston & Albany for six riveted bridges, covering in all 1,500 feet of track; also for a bridge of three spans for the Chicago & Northwestern, at Clinton, Ia. The works have been kept busy all through the past year.

The Shoener & Allen Iron Works, at Tamaqua, Pa., manufacturers of mining and blast furnace machinery, are now turning out a number of Kennedy's rock drills, which are driven by steam or compressed air.

The Harlan & Hollingsworth Co., at Wilmington, Del., recently shipped two postal cars to a railroad in Brazil.

Valley Furnace, at Sharon, Pa., is running on Bessemer iron. A second stack is ready to go into blast.

The Paxton Rolling Mill, at Harrisburg, Pa., has resumed work.

The Youngstown (O.) Bolt & Spike Works resumed work last week, having secured several orders.

Messrs. Valentine & Co., of New York, recently made a shipment of their varnishes to Peru, for use in the car shops at Lima.

The two five-ton converters in the Bessemer steel works of the Cambria Iron Co., at Johnstown, Pa., made in January 7,282 tons of steel ingots.

TRAFFIC AND EARNINGS.

Coal Movement.

Coal tonnages for the month ending Feb. 3 were as follows, the tonnage credited to each line being that originating upon it:

	1877.	1876.	Inc. or Dec.	P. c.
Anthracite:				
Philadelphia & Reading.....	322,644	220,350	Inc..	112.294
Northern Central, from Shamokin Div. and Summit Branch.....	33,940	22,806	Inc..	11.134
Central of N. J., Lehigh Division.....	141,879	230,555	Dec..	88.676
Danville, Hazleton & Wilkesbarre.....	416	2,853	Dec..	2.437
Lehigh Valley.....	269,273	285,429	Dec..	16.156
Pennsylvania & New York.....	3,451	3,776	Dec..	325
Delaware, Lackawanna & Western.....	171,922	187,350	Dec..	15.428
Delaware & Hudson Canal Co.....	163,707	176,908	Dec..	13.201
Pennsylvania Coal Co.....	75,341	109,546	Dec..	34.305
State Line & Sullivan.....	1,360	5,059	Dec..	4.299
Total anthracite.....	1,193,933	1,245,232	Dec..	51.299
Semi-bituminous:				
Cumberland & Broad.....	52,432	83,781	Dec..	31.349
Huntingdon & Broad Top.....	11,678	10,185	Inc..	1.493
Tyone & Clearfield.....	22,148	16,591	Inc..	5.647
Total semi-bituminous.....	86,258	110,467	Dec..	24.209
Bituminous:				
Barclay.....	38,892	50,966	Dec..	12.074

Business in the Cumberland Region has been affected by the labor troubles, but most of the companies are said to have compromised with their miners on the basis of 55 cents per ton. The old rate was 65 cents and the new one offered by the

companies 50 cents. The Cumberland trade has suffered quite a loss in the withdrawal of the Baltimore & Ohio Railroad's demand, that company now getting its supply from other points on the line, where it buys its coal at lower rates than it has been doing at Cumberland and Piedmont.

Some statements made at the New Jersey Central meeting last week gave rise to reports of a new combination among the anthracite companies, but they have not been confirmed, and had probably more foundation in the wishes of the speakers than in anything else.

Pittsburgh coal receipts for the year ending Dec. 31 are reported as follows by the Commercial of that city:

	1876.	1875.	Inc. or Dec.	P. c.
Pennsylvania R. R. and branches, tons.....	414,685	481,843	Dec..	67.158
Baltimore & Ohio.....	55,490	325,900	Dec..	269.510
Pittsburgh, Cin. & St. Louis.....	294,408	249,891	Inc..	44.517
Allegheny Valley.....	190,821	271,725	Dec..	80.904
Local coal roads.....	312,191	231,252	Inc..	80.939
Total by rail.....	1,267,595	1,359,711	Dec..	292.116
By water.....	2,798,333	2,046,967	Inc..	751.366
Total coal.....	4,065,928	3,606,678	Inc..	459.250
Coke, by rail.....	184,950	1,017,903	Dec..	862.953
Coke, by water.....	203,166	38,308	Inc..	164.858
Total coke.....	388,116	1,056,211	Dec..	668.095

The increase in coke receipts by water is attributed to higher rail rates and to the very low prices, which left no profit to those coke ovens which could not ship by water.

The coal tonnage of the South & North Alabama road for the year ending Dec. 31 was: 1876, 76,000 tons; 1875, 46,000 tons; increase, 30,000 tons, or 65.2 per cent.

Railroad Earnings.

The report of the Board of Public Works of the Dominion of Canada for the year ending June 30 gives the following statements for the Government roads:

	Earnings.	Expenses.	Deficit.	pr. mils.	exps.
Intercolonial.....	\$848,861	\$777,485	\$28,624	\$1,390	103.37
Prince Edward's Island.....	115,061	214,930	96,869	596	181.99

The Intercolonial was not completed for through traffic until the close of the year.

Other earnings are reported as follows:

	1876.	1875.	Inc. or Dec.	P. c.
Atlantic & Gulf.....	\$969,378	\$965,870	Dec..	\$6,492 0.7
Expenses.....	606,465	638,942	Dec..	32,477 5.1
Net earnings.....	\$362,913	\$326,928	Inc..	\$35,985 7.9
Earnings per mile.....	2,741	2,791	Dec..	50 1.8
Per cent. of exps.....	63.21	66.15	Dec..	2.94 4.5
Camden & Atlantic.....	564,851	548,493	Inc..	16,358 3.0
Expenses.....	297,878	340,851	Dec..	42,973 14.6
Net earnings.....	\$266,973	\$307,642	Inc..	\$40,669 15.2
Earnings per mile.....	8,431	8,186	Inc..	245 3.0
Per cent. of exps.....	52.73	62.14	Dec..	9.41 15.2
Dayton & Union.....	105,265			
Expenses.....	59,585			
Net earnings.....	\$45,680			
Earnings per mile.....	2,240			
Per cent. of exps.....	56.59			
Indianapolis, Cincinnati & Lafayette.....	1,461,259	\$1,602,148	Dec..	\$230,889 13.6
Expenses.....	761,248	1,036,226	Dec..	274,980 26.5
Net earnings.....	\$700,011	\$565,920	Inc..	\$44,091 6.7
Earnings per mile.....	7,899	9,453	Dec..	1,554 16.4
Per cent. of exps.....	52.09	61.24	Dec..	9.15 15.0

Month of December:

Great Western, of Canada.....	\$249,000	\$366,371	Dec..	\$117,371 32.0
Expenses.....	270,000	285,024	Dec..	15,024 5.3
Deficit or net.....	\$21,000	\$81,347		
Per cent. of exps.....	108.43	77.79	Inc..	30.64 39.3

Month of January:

Cairo & St. Louis.....	\$18,202	\$21,791	Dec..	\$3,589 19.5
Cleveland, Mt. Vernon & Delaware.....	26,379	29,049	Dec..	2,670 9.9
Cincinnati, Lafayette & Chicago.....	23,813	34,423	Dec..	10,610 30.8
Col. Chi. & Indiana Central.....	295,852			
Expenses.....	245,074			
Net earnings.....	\$50,778			
Per cent. of exps.....	82.82			
Denver & Rio Grande.....	43,270	\$33,679	Inc..	\$9,591 22.5
Ohio & Mississippi.....	395,350	315,795	Inc..	79,555 25.2

First week in February:

Atchison, Topeka & Santa Fe.....	\$29,399	\$29,249	Inc..	\$150 0.5
Chicago, Milwaukee & St. Paul.....	97,000	115,934	Dec..	18,934 16.2
Denver & Rio Grande.....	9,478			
St. Louis, Iron Mt. & Southern.....	116,700	62,627	Inc..	54,073 86.4

Second week in February:

Atchison, Topeka & Santa Fe.....	\$36,067	\$39,538	Dec..	\$3,471 8.8
Great Western, of Canada.....	\$68,578	\$76,090	Dec..	\$7,512 9.9
Week ending Feb. 9:				
Week ending Feb. 10:				
Grand Trunk.....	\$182,456	\$196,235	Dec..	\$13,779 7.0

Other earnings for January were published last week.

Grain Movement.

For January and the seven months of the California crop year ending Jan. 31 San Francisco wheat shipments were as follows:

Flour, barrels.....	44,100	1,298,500	1,519,000
Seven months.....	349,600	14,720,500	16,423,500

Of the January flour shipments 19,700 barrels were to Great Britain, and 17,300 barrels to China and Japan.

OLD AND NEW ROADS.

Central, of New Jersey.

The order of the Chancellor of New Jersey appointing Mr. Lathrop Receiver fixes his bonds at \$500,000. It gives the Receiver power, under order of the Court, to sell, convey and assign all the real estate and personal property, and pay into the courts all moneys and securities, deducting such compensation as the Chancellor shall allow; it is made his duty to run and operate the railroads described in the bill of complaint, as well as those lying in the State of New Jersey, and also those connected therewith and leased; also the ferry at the easterly end of the Central Railroad from Jersey City to New York; that he shall have power and authority to preserve and protect the corporate privileges, franchises and property of the company and of the roads in Pennsylvania from all proceedings which shall or may be taken by any parties tending to produce a sacrifice of the property committed to the said Receiver as aforesaid.

Receiver Lathrop has given notice through General Superintendent Moore that he has made arrangements to pay the engineers, firemen, brakemen, track hands and shop em-

ployes weekly, and all others monthly, and that he will apply to the Chancellor for an order authorizing him to pay up all arrears as soon as possible.

The New York Supreme Court has granted an ancillary order appointing Mr. Lathrop Receiver of the company's property in New York, and authorizing him to take possession and to exercise the same powers as in New Jersey.

On Feb. 15 the adjourned meeting of the stockholders to receive the report of the Investigating Committee was held at the office in New York. The report was very long and in parts not very clear, the committee stating that they had not employed experts to examine the books, but had done the work themselves. The bonded debt of the company on Jan. 1, 1877, was stated at \$27,394,413 besides the blanket mortgage for \$5,000,000, used principally as collateral; the company was also indorser on \$13,180,000 Lehigh & Wilkesbarre Coal Company bonds, \$3,000,000 American Dock & Improvement Company bonds and \$200,000 New Jersey Stock Yard & Market Company bonds. The floating debt at the same time was stated at \$3,468,255, besides endowments on \$1,149,921 Lehigh & Wilkesbarre paper. The committee specify a number of raised and irregular accounts and estimate the total amount of assets in the general account which are really worthless at \$8,824,827; adding to this the Lehigh & Wilkesbarre stock, bonds and debt gives a total of \$20,434,605 which is estimated as a total loss and depreciation.

After the reading of the report Mr. John Taylor Johnston made some personal explanations and there was some excited discussion, but nothing was done except to appoint a new committee to continue the investigation.

Macon & Brunswick.

The Governor of Georgia reports to the Legislature that the Commissioners have received three proposals with regard to this road. The first, from R. H. Knott, of Chicago, to lease it for \$75,000 per year, was rejected because no security was offered. The second was from L. T. Hatfield, of Maine, to lease for 20 years, paying \$60,000 the first year, \$70,000 the second, \$80,000 the third, \$90,000 the fourth, and \$100,000 per year thereafter. This was also rejected because the securities offered were all non-residents. The third was from George H. Haselhurst and associates; who offered to pay \$800,000, \$50,000 cash down, the balance in equal installments for 12 years, with interest, and \$100,000 additional at the end of the 12 years without interest. They also offer to surrender \$500,000 endorsed bonds, the legality of which is disputed.

The Commission recommend that the Haselhurst proposition be accepted, provided it is so amended as to require interest on the final payment of \$100,000. If, however, the Legislature shall reject it, they recommend that no further attempt be made to sell or lease the road until the times are more propitious.

Boston & Maine.

The strike on this road cannot be said to be at an end yet, although the company has managed to secure engineers enough to run its regular trains. The road is not running smoothly, however, and several narrow escapes from accident have been reported and several engines are said to have been injured by want of proper care and management. Some cases of attempted injury to engines by strikers have been detected, but the Brotherhood has promptly disclaimed any connection with them, and has refused in any way to assist two men who were arrested.

The hearing before the Railroad Commissioners was begun Feb. 17, when a committee of the strikers and Grand Chief Engineer Arthur were heard. Mr. Arthur's testimony was chiefly as to the objects and organization of the Brotherhood. The committee stated that before the strike they had waited on President White, but he had told them that he could not increase their pay, had no desire to do so, and that they could leave if they did not like it. He also refused to lay the matter before the board of directors. They also charged that the Engine Dispatcher had shown great favoritism and had acted with the evident intention of driving away the older men and keeping the newer men who received less pay. Some of the engineers had been on the road from 20 to 30 years, one as long as 36 years, but their pay was reduced with the rest. Mr. Arthur said that the Brotherhood had always opposed strikes, and had consented to this only as a last resort, and when the men on the road were unanimously in favor of it.

The company's side of the case was presented by President White, who said that there had been no disposition to annoy the men in any way, and that the company had shown much consideration for them. He believed that the rates offered by the company were as good as on other roads and better than those paid to other classes of employees.

The Railroad Commission has prepared a report on the strike for submission to the Legislature, which gives a history of the strike and holds that there was not sufficient cause to justify it. It concludes with the following recommendations:

"We also suggest the early passage of a penal statute to cover the following offences: The abandonment by locomotive engineers of their locomotives upon railroads in furtherance of any combination to force a strike, except at a regular schedule destination of such locomotives; the obstruction of a railroad, or the injury or obstruction of the property of any railroad corporation in furtherance of the objects of a strike; the interference with a railroad workman while in the performance of his duties, or on the premises of the company; the refusal of any locomotive engineer or railroad workman, in furtherance of the object of a strike, to aid in the movement upon the tracks of the corporation employing him of the cars of other corporations."

Another point in the case has been brought up by the company in Portland, Me., where on Feb. 20, at the instance of officers of the road, L. V. Wallace, a member of the Brotherhood of Engineers, has been arrested, charged with obstructing the United States Mail by inducing the engineers to leave work on the road. He was held in \$2,500 for examination. This is a test case and excites much interest.

Meetings.

Meetings are to be held as follows: Cleveland, Columbus, Cincinnati & Indianapolis, annual meeting, at the office in Cleveland, O., March 7.

Lehigh Coal & Navigation, annual meeting, at the office in Philadelphia, Feb. 27, at 11 a. m.

Pennsylvania, annual meeting, at Musical Fund Hall, Philadelphia, March 13, at 10 a. m.

Pacific Railroads and the Government.

A Washington dispatch of Feb. 21 says: "The Secretary of the Treasury has decided that, until Congress amends the Pacific Railroad laws, or further legislates, he has no option but to apply the whole amount of earnings for mail transportation of the several Pacific railroads and branches to the liquidation of the interest account of these roads, notwithstanding the Supreme Court has decided that the roads are entitled to one-half of such earnings."

"The accounts of the several roads for the transportation of mails to Dec. 31, 1876, have been adjusted by the Treasury Department, and the following amounts placed in the Treasury to the credit of the interest account of each company respectively: Union Pacific, \$412,723.93; Central Branch Union Pacific Railroad, \$11,840.30; Central Pacific Railroad and branches, \$578,989.52; Sioux City & Pacific, \$14,671.20.

"The account of the Kansas Pacific Railroad has not been adjusted, but there is a balance of about \$375,000 due that company for transportation of mails."

(Continued on page 90.)



Published Every Friday.

CONDUCTED BY

S. WRIGHT DUNNING AND M. N. FOENEY.

CONTENTS:

ILLUSTRATIONS:	Page.	GENERAL RAILROAD NEWS:	Page.
The Ashtabula Bridge—		Train Accidents in January..	91
Facing.....	87	ANNUAL REPORTS:	
Details of the Ashtabula		Delaware & Hudson Canal...	84
Bridge.....	86, 87	Boston & Albany.....	84
Graphical Statistics of Grain		Delaware, Lackawanna &	
Transportation.....	88, 89	Western.....	85
EDITORIALS:		MISCELLANEOUS:	
The Ashtabula Bridge.....	86	Improved Iron Rails.....	81
Grain Transportation and		Mr. Joy on the Detroit Tun-	
Exports.....	88	nel.....	81
Record of New Railroad Con-		Master Mechanics' Associa-	
struction.....	90	tion—Circular of Inquiry	
Erratum.....	90	on Engine and Tender	
GENERAL RAILROAD NEWS:		Trucks.....	81
Personal.....	83	Master Car Builders' Associa-	
Elections and Appointments.		tion—Upon Substituting	
The Scrap Heap.....	85	Steel for Iron and Iron for	
Traffic and Earnings.....	85	Wood in Car Construction..	81
Old and New Roads.....	85, 90	Meeting of Railroad Men and	
Transportation in Congress.		"Others.".....	81

Editorial Announcements.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

THE ASHTABULA BRIDGE.

It is now nearly two months since the failure of this bridge. Since that time the papers have been filled with condemnation of those who were thought to be to blame, and with all sorts of wild conjectures regarding the cause of the accident. To enumerate these latter would probably fill a column or more of the Railroad Gazette. All sorts of reasons have been given for the failure, chief among which has been the crystallization of iron. One correspondent of a daily paper, who is also a professor of engineering, grew sarcastic because the Railroad Gazette did not assign a cause for the accident, but frankly stated that the cause was not then known. Instead of speculating wildly about what might or could have been the cause we have preferred to wait patiently until full information was procurable, and then present it to our readers for their examination. In fulfillment of that purpose, we give this week two full-page engravings, one a perspective view of the bridge drawn from a photograph, and the other the detailed drawings from which the bridge was intended to be built, but from which some deviations were made when it was erected. We also give an isometric view of one of the joint blocks or skew backs, showing the attachments of the top chord, the diagonal braces and the vertical tension-rods.

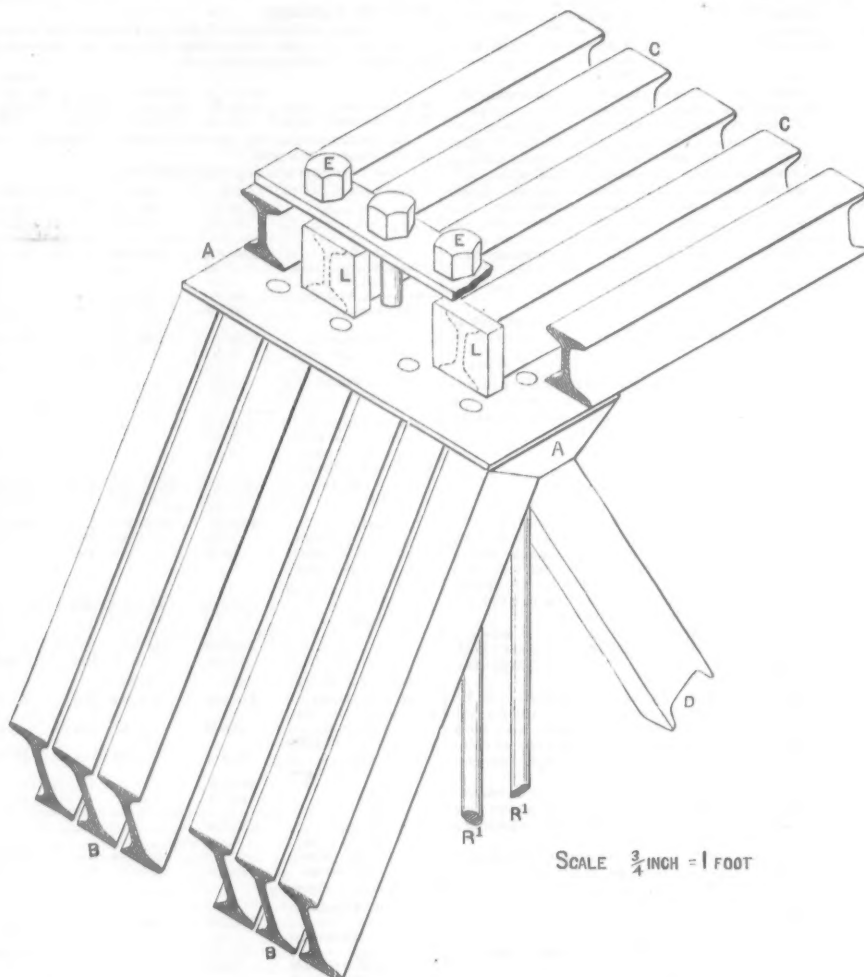
It will be seen at a glance that in no sense was this a "pin-connected bridge." There was not a pin or eye-bar in it.

The bridge was built about eleven years ago by Mr. Amasa Stone, then the President of the Lake Shore Railroad, who had been a successful railroad contractor and constructor of wooden Howe truss bridges, but who was entirely inexperienced in the construction of iron bridges and who probably had very little knowledge of the strength, powers of resistance or action of iron under stress.

A person who built bridges eleven years ago without such knowledge was much less at fault than he would be now, because such information was less accessible then. The literature at that time was confined within much narrower limits and had not grown to the proportions or assumed the value it has since. Nevertheless, Clarke's

book on the Britannia bridge was procurable. Kirkaldy's experiments had been published, and current engineering literature had already assumed a value which no engineer engaged in the prosecution of important work could afford to disregard. Neither were iron bridges unknown in this country at that time. Mr. Whipple, Mr. Linville, Mr. Fink and Mr. Bollman had all built iron bridges. The two latter gentlemen had then nearly equipped the whole of the Baltimore & Ohio Railroad with iron bridges, the posts and top chords of which were of cast iron. Mr. Whipple and Mr. Linville had each built a few bridges entirely of wrought iron. There were also specimens of plate and wrought-iron lattice bridges in existence here. The Fink and Bollman bridges had been, some of them, in successful use for five or ten years before the date of construction of the ill-fated Ashtabula structure. The Detroit Bridge & Iron Works had been engaged for several years before in building bridges under the Bollman patent, some of which were made entirely of wrought iron. The experience in the use of this material for compressive members of bridges was, however, at that time comparatively limited, and Mr. Stone's bridge was an earnest effort to improve wrought-iron bridge-building, to do which he

learn that the original plans were modified in some important particulars. To quote from the paper referred to: "All the brace beams were originally intended to be turned with their long side at right angles to the chords of the truss, and there were but four in the end panels; whereas in the bridge as it was built there were six beams in the end panels, and all were placed so that their long side stood upright. The reason given for this change was that under the weight of the bridge alone the braces as originally placed buckled and tore apart at the intersection with the counters. This change in the number and position of braces made it necessary to chip off portions of the flanges to prevent interfering with the vertical rods, and as the faces of the castings had been planed in grooves to suit the first positions, they too had to be chipped to as nearly a square bearing as possible. All this work was imperfectly done, and the result was that the braces did not have what would be understood as square bearings. In the top chord $\frac{1}{4}$ in. shim plates were found between the ends of the beams and the cast lugs; but as this was probably due to an error in the length of the chords, and were inserted to secure proper camber, they did not necessarily impair the connections. These cast lugs, however, had been



No. 2.—ANGLE BLOCK, ASHTABULA BRIDGE.

spared neither material nor expense. There were, however, at the time the Ashtabula Bridge was built, a respectable number, and it might also be said a number of bridge engineers with a respectable amount of knowledge and experience in the design and construction of such work. The faults of its design can therefore hardly be assigned to the want of then existing knowledge or of competent engineers, the employment of whom might have saved the community the loss and pain caused by this sad calamity. Doubtless no one has regretted more bitterly than Mr. Stone that such persons were not employed, because we are in truth compelled to say that the design shows most lamentable ignorance of the construction, not only of the details—that is, the method of fastening the parts of the bridge together—but also of the strength of all its compressive members. The fact that the top chord and braces were composed of separate 6 in. I-beams attached only at their ends, and in the case of the diagonal braces fastened together insecurely at their intersections, and that each beam could deflect independently of the others, reveals a source of weakness sufficient of itself to account for the failure of the bridge.

The isometrical drawing shows clearly the construction of the angle block and its connections. In the erection of the bridge a good deal of trouble was experienced owing to the want of proper supervision. From a paper prepared for the Society of Civil Engineers by Mr. Charles Macdonald, who examined the bridge very carefully, and also from the testimony which has been published, we

reduced in thickness from 2 in. to $1\frac{1}{8}$ in. for some unknown reason, and their strength to transmit the web strains was in consequence materially reduced."

From the drawings it will be seen that the horizontal component of the strain on the braces must have been transmitted to the top chord through the angle block, by means of the two lugs L, L, near the centre of the block, and was resisted only by those two beams which had a bearing against the lugs. These lugs were each 6 in. wide by $1\frac{1}{8}$ in. thick. One of them was found broken off, and its strength was materially impaired by an air or "blow-hole," so that its resisting power was probably only one-half what it would have been if the casting had been perfect.

In the paper referred to it is stated that "the amount of strain which this lug had to transmit must have been 53,000 pounds at the time of the accident; and considering the manner in which it was applied and the fault in the casting, this spot would appear to have been the weakest in the bridge."

It is hardly necessary to search further for the cause of the disaster, unless it be in the capacity of six-inch I-beams, varying from $\frac{3}{4}$ to 1 in. in the thickness of the web, which formed the top chords and braces to resist the compressive strains to which they were subjected.

All engineers who have examined the bridge have agreed that there was a superfluous amount of material in it; that no expense was spared to make it as safe as possible. The floor system, it will be observed from the drawings, was

ified in
paper re-
intended
es to the
the end
were six
at their
change
oraces as
intersec-
ber and
off por-
g with
castings
rst po-
a square
ly done,
ve what
the top
ends of
bly due
inserted
impair
d been

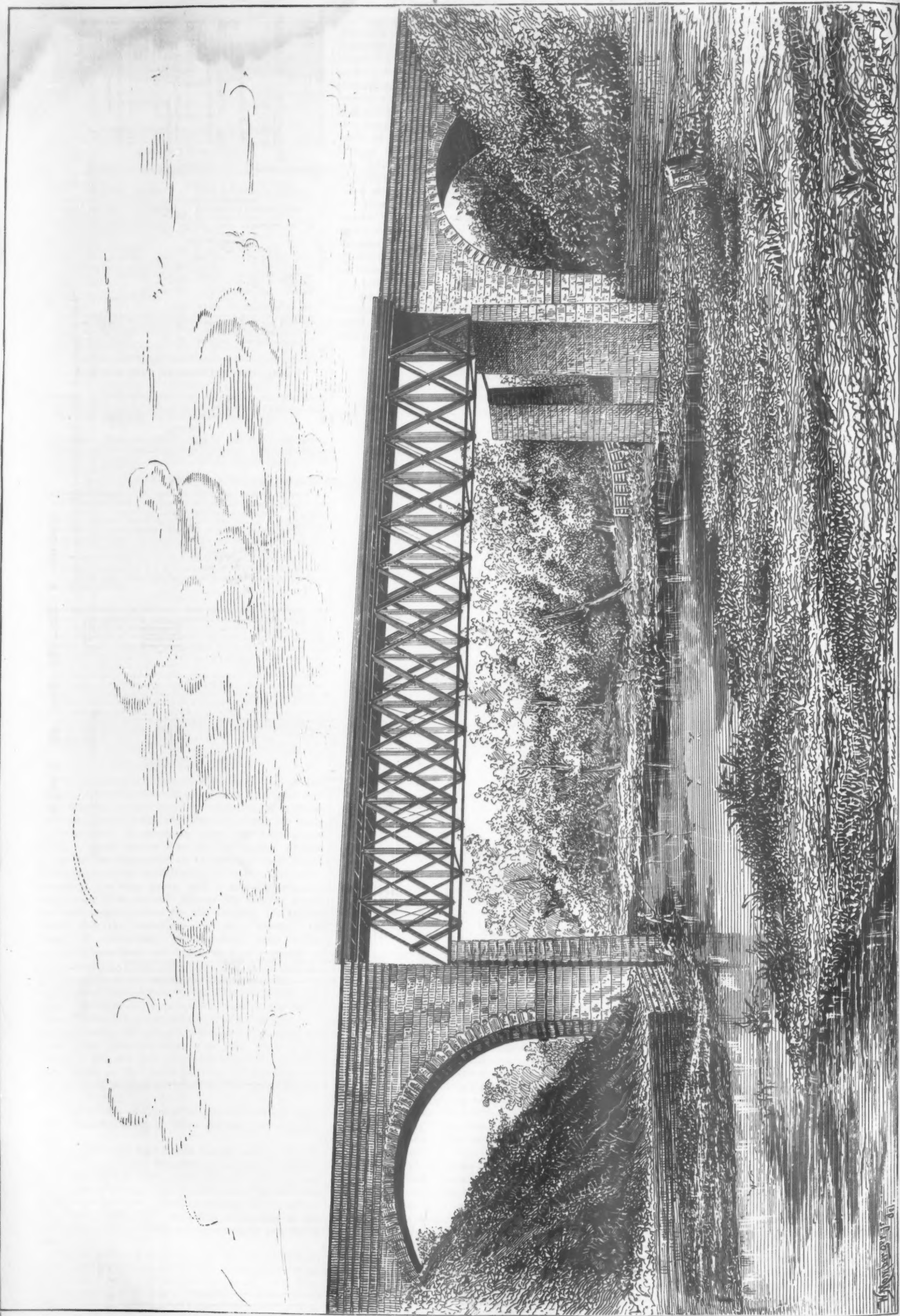
un-
web

ontal
been
t, by
ock,
d a
wide
and
ow-
one-
per-

t of
53,-
the
ast-
t in

of
I-
the
the

eed
hat
he
was



THE ASHTABULA BRIDGE.

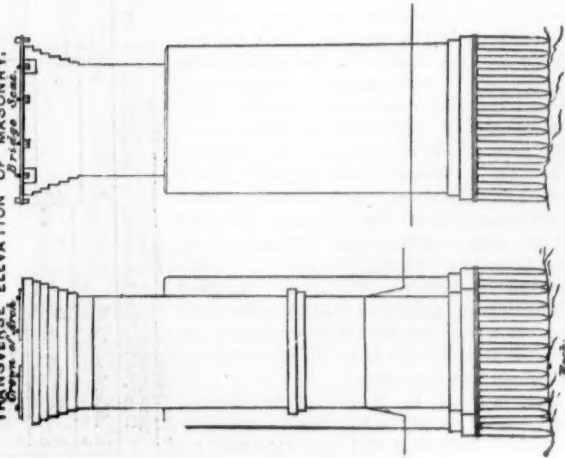
Made in 1963.



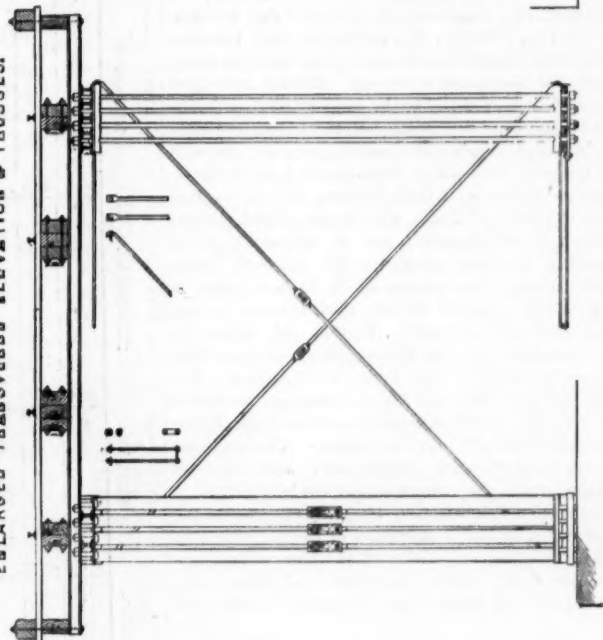
ELEVATION OF WROUGHT IRON TRUSS.



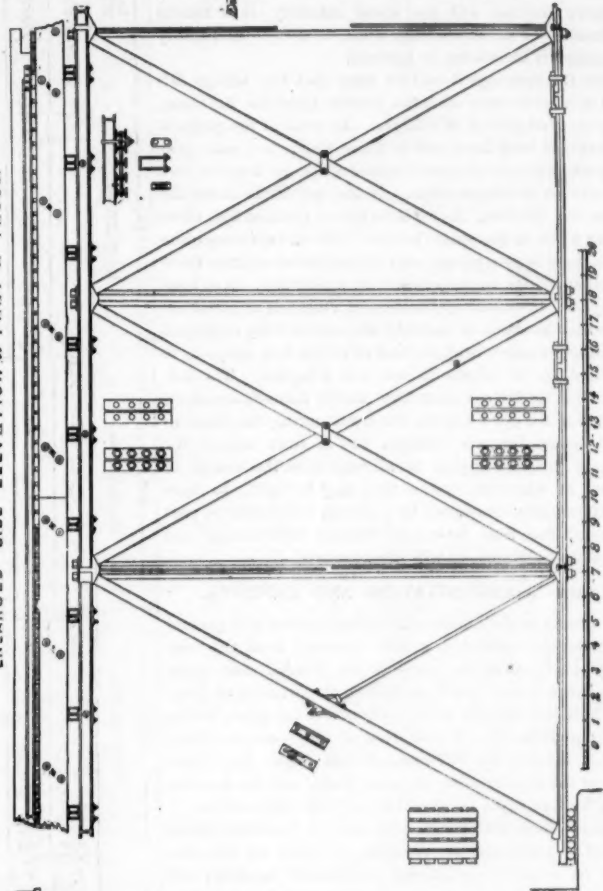
TRANSVERSE ELEVATION OF MASONRY



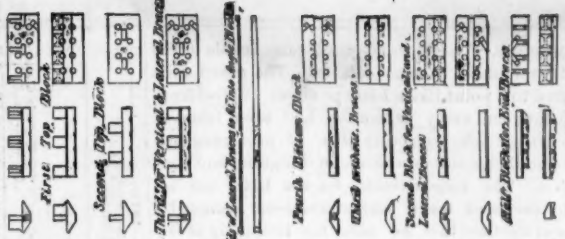
ENLARGED TRANSVERSE ELEVATION OF TRUSSES.



ENLARGED SIDE ELEVATION OF PART OF TRUSS.



CAST IRON ANGLE BLOCKS.



DETAILS OF THE ASHTABULA BRIDGE.

unusually secure. There were guard rails inside of the main rails and guard timbers outside. The guard rails were carried to a point like a letter γ about 150 feet from the abutments, and every precaution had been taken to make the bridge safe, excepting that of procuring the requisite knowledge and experience in designing and constructing it. The responsibility for the latter was assumed in the most manly and courageous manner by Mr. Stone at the time that he gave his testimony at the coroner's inquest, but the whole calamity is a fearful illustration of the retribution which is always inexorably impending if knowledge is ignored.

From the drawings it will be seen that the bridge differed in almost every essential feature from the American pin-connected system of bridges. In most of the plans of iron bridges built here, and in those which are now generally adopted, the diagonal numbers are in tension and the verticals in compression. In the Ashtabula bridge the reverse was the case. As we have before pointed out, there was not a pin in the entire bridge. The details were quite unlike those in general use, and it is doubtful whether there is another bridge in the country in which they have been employed. It was the application of a method of construction, which has been exclusively and successfully employed in building wooden bridges, and to which it is adapted, to iron bridges, to which it was not adapted. The failure of this bridge can therefore hardly furnish a pretext, certainly not a good reason, for condemning the pin-connected system for iron bridges, but it does supply the strongest possible appeal to all who have the charge of bridges, of whatever system they may be built, to have them thoroughly inspected by a person competent to pass judgment, and thus determine whether their design and construction are such as will insure safety.

GRAIN TRANSPORTATION AND EXPORTS.

Few events in the business of transportation and general commerce have attracted greater interest from the community at large than the course of the Northwestern grain movement of recent years, including the division of shipments between rail and water routes from the great Northwestern markets, the distribution of the receipts at the seaboard between the different Atlantic ports, the distribution of the exports from the same ports, and the division of New York receipts between the rail and water routes.

Some of these movements may seem to be substantially identical. Northwestern receipts, it might be thought, should be virtually equivalent to seaboard receipts; and Northwestern rail shipments to seaboard rail receipts. This is not true, however; the shipments from the great Northwestern markets by no means include the total movement from the Northwest, for a large quantity is shipped at interior stations directly to the East without an intermediate consignment to a Northwestern market, and often without passing through such a market, as is the case with most of the grain collected on connections of the Pennsylvania and the Baltimore & Ohio railroads east of the Mississippi and south of Chicago. On the other hand, neither these through rail shipments nor the shipments of the great markets are sent wholly to the seaboard cities. The local demand of the interior of the Eastern States is to a great extent supplied directly without resort to any seaport as a distributing point. Further, the shipments by water from lake ports are by no means coincident with the arrivals by water at New York and Montreal. The railroads take from Erie and Buffalo immense quantities of grain arriving by lake and carry it to New York, Philadelphia, and to some extent to Baltimore. The most that can be said is that the water receipts of the seaboard cities are included in the water shipments of the lake ports.

The points to which attention is chiefly attracted in the grain movement are the competition of the railroads with the lake marine, the competition of the Eastern railroads with the Erie Canal, and the competition of other ports with New York—all having some connection with each other.

The competition with the lakes, so far as exhibited by the comparative shipments by lake and rail from Northwestern markets (all but two of the less important being lake ports) we followed very closely throughout the last season of navigation. For that season, lasting 32 weeks, just about four-ninths of the shipments were by rail, which is a much larger proportion than ever before. But this is not a measure of the whole effect of the rail competition with the lakes. This at first had little effect on shipments to the seaboard, but included chiefly shipments directly from the farmer's station to the consumer's station in the East, avoiding a transfer at a lake port and only in part passing through a great market, so that they are not wholly included in the shipments of Northwestern markets. This whole subject of Northwestern receipts and shipments is an interesting and important one, but we will not discuss it further at this time, confining our attention chiefly to the movement to and from the leading seaboard cities.

The great question is as to the position of New York in the grain trade. Until recently it had almost a monopoly of the export trade. Indeed, it had more than that, for the superiority of its connection with the grain producers

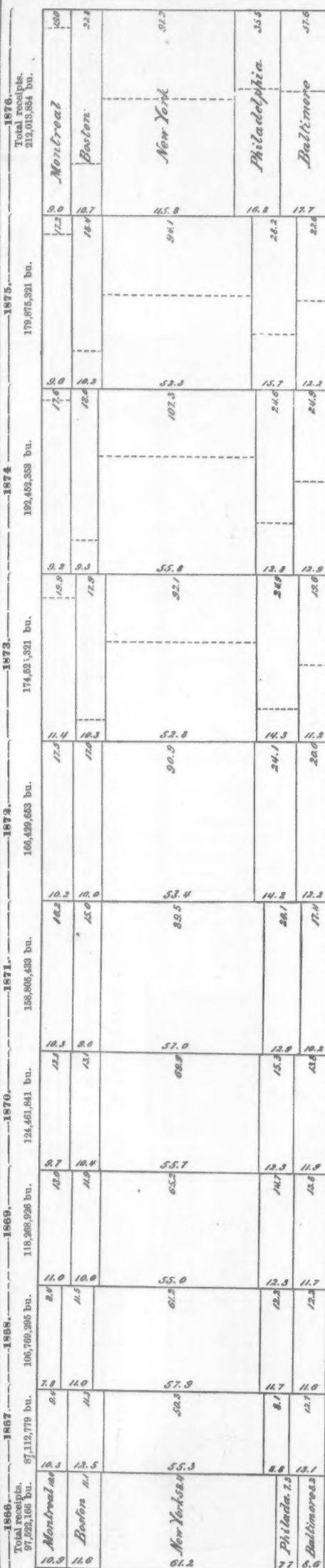


Diagram 1—Grain Receipts at Montreal, Boston, New York, Philadelphia and Baltimore for Eleven Years. The figures on the left of each small rectangle indicate the PERCENTAGE of the total receipts arriving at the port represented by that rectangle. The figures to the right represent the QUANTITY so arriving in millions of bushels. The exports for the last four years are represented by the portions of the rectangles to the left of the dotted lines.

secured it an important position as a distributing centre for home consumption. But for some years the interior and the other seaboard cities have obtained the greater part of their own supplies directly from the West, still leaving New York nearly all the export trade; later there has been the growth of a large export trade at other ports, which is regarded with fear by New York merchants as threatening to continue, and divert more and more from the grain business of New York, and likely at last to have a serious effect on its imports and general merchandise business, which so far seem not to have been much affected by the new developments in the grain movement.

The importance of this subject warrants a careful examination of the facts. This we purpose to give, so far as we can ascertain them. Mr. E. H. Walker, for some years past Statistician of the New York Produce Exchange, has made a careful record of the grain movement since he has occupied that position; but the records do not go as far back as is desirable for some particulars, especially as to the exports of other ports than New York.

In order to exhibit the progress of the great movement and its fluctuations more clearly than can be done by figures alone, we have represented the principal features of it in the accompanying diagrams, which will enable the reader to apprehend at a glance the relative positions of different markets and routes, and the fluctuations of their grain traffic in successive years. A moment's attention to the explanations of the several diagrams will, we believe, make them perfectly clear to any one.

First, we would call attention to the figure representing the total receipts of grains of all kinds (including flour and meal reduced to bushels) at each of the five principal Atlantic ports for the eleven years from 1866 to 1876 inclusive. This diagram occupies the entire second column on this page. As will be seen, it is a long parallelogram divided by lines perpendicular to its length into eleven smaller parallelograms of equal height but of varying width. Each of these smaller parallelograms represents the total receipts of grain at the five ports of Montreal, Boston, New York, Philadelphia and Baltimore for the year indicated by the large figures above it, and its base is in proportion to those receipts, which are given in bushels immediately below the figures for the year and above the rectangle representing that year's receipts. Thus the base of the first parallelogram, representing the receipts of 1866, which were 97½ million bushels, is to the base of the last, representing the 212 million bushels received in 1876, as 97½ is to 212.

Each of these parallelograms of equal height which represents a year's receipts is divided horizontally by lines forming five interior parallelograms, representing the receipts for that year at the five ports, Montreal, Boston, New York, Philadelphia and Baltimore. The names of these ports are given in their respective diagrams in the first and last years of the series; they have the same relative positions in all the other years. Now the area of the parallelograms is just in proportion to the number of bushels received, but the height of these smaller parallelograms is in proportion to the percentage of the total receipts of the year received at the port designated by it. Thus the receipts of Montreal were 10.9 per cent. of the whole in 1866 and 9 per cent. in 1876, and the height of the Montreal diagram is thus about one-fifth greater in the first than in the last year; the fact that the Montreal receipts increased from 10,400,000 bushels in 1866 to 19,000,000 in 1876 is indicated by the greater area of the parallelogram for the latter year, caused by its greater length. Following the lines from left to right in the direction of the length of the whole figure, we see at a glance the variations in the proportions of the total receipts at each port. The variation in the total amounts at each port in different years is not so readily evident from this diagram. But the figures are given on it both for percentages and for the number of millions of bushels. The figures for the percentages are on the left-hand side of the parallelograms; those for millions of bushels on the right-hand side.

This diagram of receipts at the five ports named is suggestive. First note the difference in the width of the rectangles for each year. The increase is enormous and almost constant, and in 1876 the total receipts were 117 per cent. greater than in 1866—an average increase of 8 per cent. yearly. This great increase in the total receipts at the seaboard should always be kept in mind; for the older markets have less reason to be jealous of the growth of business in the newer ones, when that increase is simply a portion of a new business and not obtained by reducing the business at the older markets.

Let us now consider the course of receipts at each port, beginning with the northern ones and the upper rectangles. The most remarkable feature here, in the cases of both Montreal and Boston, is the remarkable uniformity of the percentages of total receipts arriving at these ports in different years: the boundaries of their rectangles do not vary much from a straight line. From 1866 to 1876 Montreal has never had less than 7.8 nor more than 11.4 per cent. of the total; Boston, never less than 9.3 and never more than 12.5 per cent. Their receipts have increased about as the total receipts at the five ports have

increased. Together, for the last five years these two ports have averaged just 20 per cent. of the total. They are, moreover, nearly equal to each other in receipts, and this although, as we shall see further on, one exports nearly all, and the other comparatively little of its receipts.

Passing now to New York, whose rectangle every year is by far the largest of the five, we see that it does not maintain its height, but that there is, on the whole, a progressive decrease in its proportion of the total receipts. Beginning with 61.2 per cent. of the whole in 1866, it had but 45.8 per cent. in 1876—a reduction of one-fourth. It should be observed, however, that both of these extreme years were exceptional. The New York receipts were but 55.3 per cent. in 1867, and they were as much as 52.3 per cent. in 1875. For the eleven years they average 54.7 per cent. They reached this proportion, however, but once since 1871, and there is of course a possibility—more properly a probability—that the movement of 1876, when its proportion was smallest, will not prove exceptional hereafter. Nearly all this time, however, the quantities received at New York have been increasing. They were 58½ millions in 1866 and 50 millions in 1867, while in 1876 they were 97 millions.

The greatest changes we find in the southern ports, Philadelphia and Baltimore. Casting the eye along the lines which bound the upper sides of their rectangles we find that several well-defined upward steps have been made. Philadelphia had but 7.7 per cent. of the total in 1866, but in 1868 it had 11.7; in 1872, 14.2; in 1876, 16.8. In the first of the eleven years it had one-thirteenth of the total; in the last, one-sixth. Baltimore has made equal but not parallel progress. Indeed, we may say generally that it made but two advances, from 8.6 per cent. of the total in 1866 to 13.1 in 1867, and from 12.2 in 1875 to 17.7 per cent. in 1876. Its receipts increased just about with the total receipts from 1867 to 1875. Its great advance was made only last year.

Below we give the percentage of the total receipts of the five ports received at each port for the eleven years. The figures are the same as those on the left-hand sides of the rectangles:

	Montreal.....	Boston.....	New York.....	Philadelphia.....	Baltimore.....	All but New York.....
1866.....	10.9	11.6	61.2	7.7	8.6	38.8
1867.....	10.3	12.5	55.3	8.8	13.1	44.7
1868.....	7.8	11.0	57.9	11.7	11.6	42.1
1869.....	11.0	10.0	55.0	12.3	11.7	45.0
1870.....	9.7	10.4	55.7	12.3	11.9	44.3
1871.....	10.3	9.6	57.0	12.9	10.2	43.0
1872.....	10.2	10.0	53.4	14.2	12.2	46.6
1873.....	11.4	10.3	52.8	14.3	11.2	47.2
1874.....	9.2	9.3	55.8	12.8	12.9	44.2
1875.....	9.2	10.2	52.3	15.7	12.2	47.7
1876.....	9.0	10.7	45.8	16.8	17.7	54.2

Here the last column is the most interesting, showing as it does the progress of the four ports, Montreal, Boston, Philadelphia and Baltimore, together. A further and perhaps a more striking illustration of the progress in total receipts, in New York receipts, and in the receipts of the four other ports will be found on Diagram 2, which is of a form commonly employed, and hardly needs any explanation. The points of intersection with the perpendicular lines for each year represent the quantities received, and the figures at these intersections stand for millions of bushels.

In considering the quantities of grain received at different ports, we must bear in mind that while part is destined for export, another part is for domestic consumption; and that while it is a matter of indifference, comparatively, by which port grain is exported, the domestic market of each port is pretty strictly limited of late years. New York requires just about so much grain for its own consumption and for distribution for home consumption; and this amount it is likely to receive under any ordinary circumstances. This is not true of the export grain. Should the cost of exporting through Montreal or New Orleans become ten cents (or less) per bushel lower than the cost by way of New York, and remain so throughout a year, New York doubtless would lose nearly all its export trade, while maintaining nearly its other grain trade. During the seven years from 1870 to 1876 the difference between the receipts and exports at New York varied only from 37,800,000 to 45,700,000 bushels; it was 40,600,000 in 1870 and 40,500,000 in 1876, though meanwhile the receipts varied from 70 to 104 million bushels. Thus the portion of the business most liable to fluctuation is the export movement. New York has no reason to fear because Philadelphia consumes more grain than formerly; it cannot expect to have any appreciable share of the traffic in grain consumed in other northern cities. But all exports of grain it looks upon naturally as a business which it might possibly have had; and it is the fluctuations in exports, rather than those in receipts, which interest all the ports competing for the grain trade.

We have not been able to ascertain the grain exports of

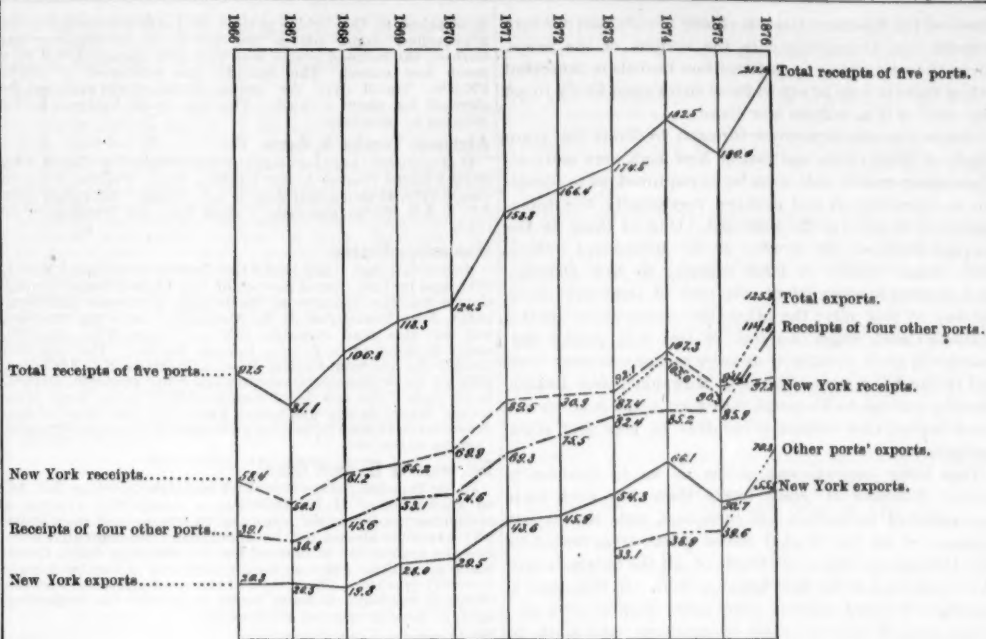


Diagram 2.
Course of Grain Receipts and Exports for Eleven Years.
[The figures at the intersections of lines indicate millions of bushels.]

any port except New York for more than four years. The New York exports are represented on Diagram 2 for eleven years, the same as the receipts, and the sum of the exports of the four other ports also on that diagram for the four years from 1873 to 1876. The latter shows why and with how good reason New York is alarmed. The increase in the receipts of the other ports has been wholly for export. They keep from 45 to 50 million bushels for consumption and for local distribution, and export the remainder; and this remainder increased from 33 million bushels in 1873 to 70 millions in 1876, New York's exports meanwhile increasing only from 54 to 55 millions. In 1873 the competing ports exported 38 per cent. of the total; in 1876 nearly 56 per cent. We may say that the entire increase in the export business has been done through the other ports.

In Diagram 1 the exported portion of the receipts of each port for these last four years is represented by the part of the rectangle representing those receipts to the left of the dotted line. Some important facts are indicated here. Montreal, which is not much considered as a competitor, is seen to export nearly all its receipts. It is thus more formidable as a competitor than would appear from its receipts. Boston, which usually receives about as much grain as Montreal, exports but a very small proportion of these receipts. Its export business, though larger than formerly, is still comparatively trifling, amounting even in 1876 to only 4½ per cent. of the total exports of the five ports, though it had 10½ per cent. of the receipts. Its large grain business is overwhelmingly a domestic trade. New York, as we have seen, requires something like 40 million bushels besides its exports, whatever they may be. These are sometimes less than half of its receipts, sometimes much more; last year they were 57 per cent. of its receipts. The Philadelphia exports show the greatest comparative growth. They were a mere fraction (19 per cent.) of its receipts in 1873, but had become 62 per cent. in 1876. Baltimore has increased its proportion more slowly, having been a large exporter in 1873, and in 1876 exporting nearly as large a proportion of its total receipts as Philadelphia did. Below we give the figures for these exports:

	1873.	1874.	1875.	1876.
Bushels:				
Montreal.....	17,127,345	16,492,708	15,384,880	17,460,452
Boston.....	3,145,364	3,186,318	3,987,959	4,043,298
New York.....	54,278,072	66,088,650	50,686,401	55,500,158
Philadelphia.....	4,807,620	6,671,334	9,846,515	22,016,515
Baltimore.....	9,049,545	12,555,090	11,407,489	24,761,307
Total.....	87,407,846	104,994,100	90,313,244	128,771,730
Total except New York.....	33,129,774	38,905,480	39,626,843	70,271,572
Percentages:				
Montreal.....	19.60	15.72	17.03	13.88
Boston.....	3.45	3.03	4.42	4.80
New York.....	62.10	62.94	56.12	44.14
Philadelphia.....	5.50	6.35	9.80	17.50
Baltimore.....	10.35	11.96	12.63	19.68
Total.....	100.00	100.00	100.00	100.00
Total except New York.....	37.90	37.06	43.88	55.86

The reason why the southern ports have been able to increase their exports so largely we have endeavored to point out heretofore. The great reduction in rail rates, especially in the summer, has deprived New York of its former advantage as the sole terminus of the cheapest route. So long as the canal afforded the cheapest channel for the transportation of grain, New York, other things being equal, was sure to receive most of the grain destined for export. But whenever rail rates are as low as canal rates, Philadelphia and Baltimore are able to compete for it on terms of equality. Meanwhile, the long

monopoly of exports which New York has enjoyed has made it possible to introduce and maintain a rate of taxes for handling and merchants' dues at the terminus such as would have been impossible had the competition of the other ports been sharper. It is conceded, we believe, that New York takes larger tolls than any other port out of the grain exported, and the grain merchants find it very difficult to reform this. The business is old; the methods of doing it long established; a large number of influential people are interested in preserving every tax on the grain; and there is much greater difficulty in combining to introduce a reform than when the business is comparatively new and abuses less firmly rooted.

It is not easy to see how the business which has been begun at Philadelphia and Baltimore can be diverted to New York without a considerable reduction in the expenses of exporting by way of New York. Such reduction must be either in the cost of carrying to New York, in the expenses at New York, or in the cost of carrying from New York, as compared with the corresponding expenses at the competing ports. As to the first, nothing more can reasonably be expected from the New York railroads. The action of the New York Central & Hudson River Company last season has resulted in overcoming the difference of six cents per bushel on wheat formerly existing in favor of Philadelphia and Baltimore on rail receipts exported. It certainly is not reasonable to expect that the New York railroads will carry for less than their competitors, and they will not be able to if they try. The only hope in this direction is in cheapening the water route; and the abolition of tolls on the canals will not be sufficient, we imagine, to effect the desired result. Such a cheapening of this route there is no reason to expect, for the present at least. What improvements of the canal and of the motive power for canal boats may do towards reducing expenses we are not likely to know this year or next. As to the reduction of expenses at New York, there seems great room for it and every reason to attempt it, and very little hope that the position of the city can be maintained without it. As to the ocean rates, they are at least as low from New York as from Philadelphia and Baltimore. They cannot be made so much lower as to be less profitable, otherwise the vessels will leave the New York trade. It thus appears that there is little room to hope for a reduction in the expenses of exporting grain by way of New York except in the terminal expenses, and in possible future canal improvements. One other method of improving its comparative position would be a general advance of railroad rates, so as to leave the water route the cheapest, as it always was until last year. This is not impossible, we suppose. The great railroad companies may have been satisfied by last season's experience that it does not pay to compete with the water route when lake and canal rates are low. But it will be difficult for the Pennsylvania and the Baltimore & Ohio companies to refuse so to compete, however well satisfied they may be of the unprofitableness of the business. By their action in so competing an enormous business has been established at Baltimore and Philadelphia which can be maintained only by a continuance of that policy. It is hardly probable that they will abandon it.

And it is reasonable to suppose that these ports have not yet reaped the full benefit of this policy. It is a new one; their business is comparatively new; and it has room to grow doubtless, if the comparative advantages of the different ports do not change. It is likely to fluctuate, and to fluctuate more than the New York traffic; for the

trade of the Southern cities is chiefly in corn, and our corn exports vary enormously with the surplus of the crops, from almost nothing up to 60 million bushels or more; but when there is corn to export these cities seem likely to get the most of it as matters now stand.

But works now in progress threaten to divert the grain traffic of these cities, and that of New York even more so. Two water routes will soon be so improved as to cheapen in some degree, and perhaps very greatly, the transportation of grain to the seaboard. One of these is the improvement of the mouth of the Mississippi, which will admit vessels of large capacity to New Orleans, and cheapen to some extent the cost of exporting grain by way of that city; the other the enlargement of the Welland Canal, which in a year or two will permit the passage of grain vessels, of as large capacity as most that sail on the lakes, from Chicago, Milwaukee and Duluth directly through to Montreal with very little delay or expense beyond that ordinarily incident to lake and river navigation.

This latter improvement seems to us to threaten a greater diversion of grain traffic than has ever been accomplished heretofore. It threatens, too, the export business of all the United States ports, from Boston to New Orleans, and the grain traffic of all the railroads east of Chicago and of the Erie Canal as well. It threatens a diversion of wheat exports even more than of corn exports; and, if its cheapness is anything like what is claimed for it, it is very hard to see how any route can be made to a United States port which will equal it. We see that Montreal already has a large export trade, largely secured by the present inferior Welland Canal, and that it has nearly maintained its proportion of its exports in the face of last season's rail rates, which were often lower than the lake and Erie Canal rate. Certainly, if the route is cheapened to any extent, it is likely to obtain a larger share of the traffic than heretofore.

So far as the railroads are concerned, we believe they have little direct interest in carrying grain during the season of navigation. There is no reason to believe that they can meet low water rates and make any profit. The several lines are, however, greatly interested in maintaining and increasing the business of the ports at their termini, and in the existence of a grain trade which will pay them some profit in the winter if it does not in the summer. The roads to New York could afford to be indifferent to this trade, if their competitors would be; for the canal would secure that city the grain during the season of navigation, and establish a trade which might be profitable to the roads when navigation was closed, besides stimulating the general merchandise business of the city. The roads to Philadelphia and Baltimore, however, must carry the grain all the year round. They must compete with water rates in order to have any summer export business; and there is not likely to be any considerable export business unless it can be carried on in summer as well as winter.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Houston & Texas Central.—The *Waco Branch* is extended from Waco, Tex., north by west to White Rock, 11 miles.

Southern Pacific.—The *Yuma Division* is extended from Indian Wells, Cal., east by south to Castle Rock, 30 miles.

This is a total of 41 miles of new railroad.

Erratum.

In a letter by Mr. Charles Bender, published last week, a quotation from a letter from Mr. Stenberg was printed "The constructions by suitable castings are very good," in which connections should be read for "constructions."

OLD AND NEW ROADS.

(Continued from Page 85.)

Atlantic & Pacific Telegraph.

The Western Union Company has begun suit to enjoin this company from using the Baltimore & Ohio lines under the recent transfer.

At a meeting held in New York, Feb. 19, five new directors were chosen, including Presidents Garrett, Scott, Jewett and Garrison. President Eckert presented a report recommending the construction of about 10,000 miles of new line, and it was resolved to sell the 30,000 shares of stock in the treasury at \$20 per share to provide for these extensions. It is stated that the whole amount was at once taken.

Ohio & Mississippi.

The hearing of arguments on the petitions for a change in the receivership has been postponed by the United States Circuit Court until Feb. 23.

Galveston, Harrisburg & San Antonio.

The formal opening of this road took place Feb. 16, when an excursion train with a large number of officials and invited guests ran through to San Antonio. Regular trains are now running to that city.

Levis & Kennebec.

After some resistance from the lessee, the agent for the bondholders took possession of this road Feb. 15. The road is not being operated at present.

New Orleans, Jackson & Great Northern.

A meeting of the bondholders was held at the Illinois Central office in New York, Feb. 15, to take some action as to the purchase of the road at the approaching foreclosure sale. After some discussion it was resolved to adjourn to Feb. 26, by which time representatives of the English bondholders are expected to arrive.

Illinois & St. Louis Bridge.

On the 20th a fire broke out in some houses adjoining the

approaches to the bridge in East St. Louis and spread to the approaches. Some 600 or 800 feet of the carriage-way was burned; the railroad bridge floor was also damaged, but to a much less extent. The damage was estimated at about \$50,000. Travel over the bridge would, it was expected, be stopped for about a week. The loss on the bridge is partly covered by insurance.

Atchison, Topeka & Santa Fe.

It is reported that this company has bought the Canon City Branch of the Denver & Rio Grande, from Pueblo, Col., to Canon City, 41 miles, and that it will change the gauge from 3 ft. to 4 ft. 8½ in., and make Canon City the terminus of its road.

Mississippi Central.

Notice is given that under the deed of trust dated May 1, 1872, and by authority of decrees of the United States Circuit Court for the districts of Mississippi, Tennessee and Kentucky, John Newell and J. B. Alexander, surviving trustees, will sell this road at public sale in Jackson, Miss., April 26, under direction of G. R. Hill, Special Master. The sale will include the line from Canton, Miss., to Fillmore, Ky., 339 miles, with all the equipment, franchises and other property, and will be for cash. The sale is, of course, subject to the liens prior to the consolidation mortgage, which, by the latest report, amounted to \$4,688,115, besides an income and equipment mortgage for \$5,000,000.

Delaware & Hudson Canal.

Judge Donohue, of the New York Supreme Court, on Feb. 16, on application of H. B. Anderson, a stockholder, granted a preliminary order to the company to appear and show cause why a receiver should not be appointed. Subsequently, however, on application of counsel for the company, Judge Donohue rescinded the order on the ground that it had been inadvertently granted. The ground of the application was that the company was about to issue bonds to provide for its floating debt, to the detriment of stockholders.

Dividends.

Dividends have been declared by the following companies:

Chicago, Burlington & Quincy, 5 per cent., semi-annual, payable March 15.

Chicago & Alton, 4 per cent., semi-annual, payable March 1.

Erie.

London telegrams state that holders of a majority of the first consolidated bonds have given their assent to the plan of reconstruction, and that there is now a fair chance that it will be carried out. It requires the payment of one coupon on these bonds on the 1st of March next.

Arrangements are being made to extend the third or standard gauge rail from Waverly, N. Y., eastward to Binghamton, 41 miles, in order to secure the Albany & Susquehanna connection. This would enable the Erie to compete for New England business to better advantage, as cars could run through between the Northwest and New England by this route as they now do by the New York Central.

Illinois Central.

Mr. H. J. de Marer Oyens, who was chosen chairman of the committee appointed by the Dutch stockholders to visit America, but declined, has reconsidered his determination and is now on his way here.

Pennsylvania.

On the night of Feb. 17 seven spans of the long wooden bridge over the Susquehanna at Selinsgrove, Pa., on the Sunbury & Lewistown Branch were destroyed by fire. An eighth span was thrown down to stop the fire and save the rest of the bridge. The loss is estimated at \$30,000.

The old wooden bridge over the Passaic at Centre street, Newark, is to be replaced by a new iron bridge, work on which is to be begun very soon. During its erection the use of the Centre street loop line will be suspended and all trains will pass over the Market street bridge, but a passenger car will run between Market and Centre street stations in Newark to accommodate passengers from that city.

Cleveland & Newburg.

This road is now in possession of a receiver, and will probably be sold. It is 3½ miles long, from Cleveland, O., to Newburg, and is a light suburban passenger road.

St. Joseph & Des Moines.

A company by this name has been organized in St. Joseph, Mo., to build a narrow-gauge railroad from that city northeast to the Iowa line in Harrison County, about 75 miles.

New York & Oswego Midland.

The receivers are having trouble with tax collectors at different places on the line, and have lately closed the station at Central Square in Oswego County, N. Y., and ceased to stop trains there on account of an assessment which they claim to be excessive.

Chesapeake & Ohio Canal.

A special meeting was held in Annapolis, Md., Feb. 13, when President Gorman submitted a report on the condition of the canal and certain proposed improvements. The report was referred to a committee composed of five stockholders and five bondholders.

North Carolina.

Notice is given that the principal of the bonds issued March 1, 1877, will be paid on and after March 1, 1877, on presentation at the Treasurer's office at Company Shops, N. C. No interest on these bonds will be paid after March 1.

Atlanta & Richmond Air Line.

The United States Circuit Court at Atlanta, Ga., has confirmed the sale of this road and ordered a final reference to fix the amount of costs and legal expenses in the case.

Pittsburgh, Wheeling & Kentucky.

The West Virginia Legislature has finally passed the bill authorizing the counties of Ohio and Brooks to sell their stock in this company and all their claims against it, and also to authorize the purchase of the property by a new corporation.

Kent County.

This road was sold at Chestertown, Md., Feb. 15, under foreclosure of mortgage and was bought for \$33,450 by J. W. Sterling and Richard Hynson, trustees under the first mortgage. The road is 26 miles long, from Massey's Junction, Md., to Parsons.

St. Paul & Pacific.

The holders of the Extension bonds have submitted a memorial to the Minnesota Legislature protesting against the bills before it with regard to the road, and explaining that they ask only for an extension of time for the completion of the road, and desire no other legislation.

Syracuse, Geneva & Corning.

The contract for all the wooden bridges and trestles on this road has been let to George W. White, of Pulaski, N. Y.

Chicago, Danville & Vincennes.

In the United States Circuit Court in Chicago, Feb. 17, the Special Master reported the facts of the sale and also that the cash payment required had been made. The purchasers filed a petition for confirmation of the sale, setting forth that they represent 2,315 Illinois Division and 1,207 Indiana Division bonds, and that they are prepared to pay the cash proportion

due under the sale on those bonds not uniting with the purchasers. The court ordered that the Master's report stand confirmed, unless objections were filed by Feb. 23, and set that day to hear argument on the petition.

Buffalo & Jamestown.

A meeting of representatives of the towns owning stock in this road was held in Buffalo, Feb. 15. Receiver Scattergood made a verbal statement to the effect that the cost of the road was about \$2,800,000; that the net earnings for the past year were \$140,000, as near as could be estimated; that the road was now in first-class condition, and the earnings were steadily and handsomely increasing. A resolution was unanimously passed providing that application be made to the Legislature for such action as might be necessary to enable the towns to protect their interests in the road.

Houston & Texas Central.

Orders have been given to prepare for the change of gauge of the Western Division from 5 ft. 6 in. to 4 ft. 8½ in. The Western Division is 116 miles long, from Hempstead to Austin, and is the only line of 5 ft. 6 in. gauge remaining in Texas. The track on the extension of the Waco Branch is now laid to White Rock, 11 miles north by west from Waco. The grading is done for nine miles further.

Logansport, Crawfordville & Southwestern.

The Evansville & Crawfordville Company has begun suit to recover \$19,000 damages for depreciation in condition of the 21 miles of its road leased to this company since the commencement of the lease. The leased road extends from Terre Haute, Ind., northeast to Rockville.

Connecticut River.

This company has applied to the Massachusetts Legislature for authority to lease railroads out of the State, which authority is not conferred by its charter or the general law, although it has power to lease roads in Massachusetts. The intention is understood to be to build up a through line, but what roads are to be included is not stated, though the Vermont Valley would doubtless be the first.

Atlantic & Great Western.

A general meeting and election of directors was to be held in Cleveland, O., Feb. 15, as heretofore noted. Before the time of meeting, however, Messrs. Woodman, Burke and Huidekoper, representing the English bondholders, sued out an injunction restraining the officers and stockholders of the company from holding any meeting whatever, and no meeting was held.

Atlantic & Gulf.

At an adjourned meeting of bondholders in Savannah, Feb. 13, the committee reported in favor of a commencement of legal proceedings looking to a foreclosure and sale of the road. A resolution for the appointment of a committee to conduct the proceedings was offered, but, after some discussion, the whole subject was postponed to an adjourned meeting, to be held Feb. 17. No action on the default was taken at the stockholders' annual meeting.

Boston, Clinton, Fitchburg & New Bedford.

The hearing before the Railroad Committee of the Massachusetts Legislature on this company's petition for authority to issue \$2,500,000 preferred stock to fund the floating debt is said to have brought out some curious financial management. At the time of the consolidation last July the Boston, Clinton & Fitchburg stock was put in at \$75 per share, and the New Bedford stock at \$110, stockholders of the latter company being given the option of selling their stock to the new company for cash. So many of them preferred stock to new stock that about \$1,200,000 was required to pay them off, thus accounting for about half the floating debt. For the rest it is charged that while the floating debt of the Boston, Clinton & Fitchburg Company was in July stated at \$75,000, it was really about \$350,000, most of it being money borrowed to pay interest and dividends which the road had not earned, and for costly terminal property at Lowell. Further, the company's endorsement has been put on \$244,000 Framingham & Lowell notes without the knowledge of most of the board. Most of the irregularities are charged to Manager Blood and Treasurer Huntley, both of whom resigned lately, and who, it is charged, ran the road as they pleased, and made such returns as they pleased, covering up the real condition of the company. The new management desires to put the company in good condition again; several of the directors and stockholders are wealthy men and offer to take up the preferred stock if it is issued, believing that with care and good management the road can be made to pay. It is not charged that any money was stolen, but that it was applied to keeping the company apparently prosperous.

The latest report is that parties interested in the Boston & Providence are trying to get control of this company, whose New Bedford line interferes somewhat with that road as well as with the Old Colony. The road could be worked very well by either company.

Brattleboro & Whitehall.

It is said that subscriptions to the stock of this new company are not coming in as fast as was expected. Some of the towns on the line have voted to bond in aid of the road, but in others there is a very strong opposition to bonding. The managers have been making arrangements to begin work this spring, but unless there is a change, they will hardly be able to do so.

New Jersey & New York.

The Rogers Locomotive Works give notice that they will sell at Hackensack, N. J., March 2, eight locomotives built by them and now in use on the New Jersey & New York road. They are 16 by 24 in. cylinders, drivers 5 ft. diameter, tender tanks 1,800 gallons capacity. The engines are built to burn anthracite coal and are of 6-ft. gauge, but were designed with special reference to an expected change to 4 ft. 8½ in. The sale will be for cash.

West Chester & Phoenixville.

This company was organized several years ago to build a railroad from West Chester, Pa., to Phoenixville, about 14 miles, but nothing has ever been done except to survey the line. Recently interest in the project has been revived and it is now proposed to build from West Chester north to the crossing of the Chester Valley road in Whiteland township, about five miles. The object is to get a connection with the Reading road.

New York & Albany.

Mr. Lewis B. Hall has been appointed Receiver of this company under a judgment for legal services obtained by Peckham & Tremaine, of New York, and the New York Supreme Court has authorized him to sue subscribers to the stock for unpaid balances, the company having no assets. The company was organized several years ago, but never did anything except to have some surveys made.

Wabash & Erie Canal.

The United States Circuit Court has ordered the trustees to make a final settlement by April 1, and has appointed S. B. Gookins, of Terre Haute, Ind., Receiver to wind up the business of the company.

Southern Pacific.

The terminal station on the Yuma Division has been removed to Castle Rock, 30 miles east by south from Indian Wells, Cal., the late terminus, 160 miles from Los Angeles and 630 from

San Francisco. There are still 85 miles of track to be laid to reach Fort Yuma, on which work is progressing rapidly.

The Los Angeles Herald says: "Messrs. Crocker & Colton have approved the plan for a railroad from Mojave to Independence. They said they would build the road themselves. They would not only build the road, but they would extend it on to Southern Utah, where there were a number of excellent coal mines. They regard the project as an eligible one in every respect; and, just so soon as the large force at work pushing the Southern Pacific from Indian Wells to Yuma should be through with that job, they intended to wheel them around and put them on the hundred miles which separate Mojave from Independence."

Surveys are being made for a branch from the coast line near Menlo Park southward through San Mateo and Santa Cruz counties to Santa Cruz.

Danbury & Cohasset.

The Massachusetts Railroad Commission has granted the petition of the town committees of the towns interested in this road for an investigation of its affairs. The first hearing was held in Boston, Feb. 15, the towns being represented by counsel. The Commission, after hearing statements, decided to proceed no further, as there were no grounds for an investigation.

Boston & Lowell.

The employees of this road are to be required to sign an agreement releasing the company from all liability for any damages in case of injury to them from any accident while employed on the road. It is said that the signing of this agreement will be made a condition of their continuance in the employ of the road.

Woodstock.

This road is substantially owned by the town of Woodstock, Vt., which subscribed \$100,000 to the stock and guaranteed the interest on \$250,000 bonds. In its first year's operations there was a surplus of earnings over running expenses of about \$5,000, but very nearly all of this was spent in building culverts, ballasting and other improvements, and the town has had to meet the interest. The officers have been much blamed for these expenditures, but they claim that they have done nothing that was not absolutely necessary.

Pittsfield & North Adams.

At the annual meeting, Feb. 14, the stockholders voted to ratify the new lease of the road to the Boston & Albany, which takes the place of one lately expired. The new lease is for 99 years and the rental is to be 5 per cent. on the capital stock, which is \$450,000. Under the old lease the rental was 6 per cent. on the stock.

North Brookfield.

The lease of this road to the Boston & Albany is for ten years, and the lessee is to pay as rental 25 per cent. of the receipts, after deducting annually \$2,000 per year for use of equipment, the North Brookfield Company to pay the taxes. The road is five miles long, from East Brookfield to North Brookfield village; it was built in 1875, and has been very successful for a short local road.

Sharpsville, Wheatland, Sharon & Greenfield.

It is stated by local papers that a controlling interest in this road has been bought by parties interested in the Atlantic & Great Western, and that they will change the road to standard gauge and extend it to the coal fields in Hickory township, about six miles. It is now of 3 ft. gauge and extends from Sharon, Pa., eastward four miles.

Central, of Georgia.

This company has contracted with John Roach & Co., of Chester, Pa., for two iron steamers for its line between Savannah and New York. The steamers are to be alike, each 300 feet long, with a carrying capacity of 4,000 bales of cotton and good passenger accommodations. They are to be capable of running at a high speed.

Xenia & Fort Wayne.

Among the latest of the many narrow-gauge projects now being advocated in Western Ohio, is one for a line from Xenia, O., north by west to Fort Wayne, Ind., about 120 miles. It is intended as an outlet for the coal which the Dayton & South-eastern is to bring to Xenia.

Mobile & Ohio.

The question of the trusteeship under the first mortgage was to come up before the United States Circuit Court at Mobile this week, on a motion made by counsel for Mr. Morris Ketchum to have George S. Coe and Philo C. Calhoun, of New York, appointed trustees with him to fill the alleged vacancies in the trusteeship. Mr. Ketchum's petition was filed Feb. 17, and the preliminary argument was begun Feb. 19.

Montana.

The Territorial Legislature has passed and the Governor has approved the bill providing for a subsidy of \$170,000 in aid of a narrow-gauge road from Franklin, Idaho, the terminus of the Utah Northern, to Helena, Montana. The bill is to be submitted to the people for ratification at an election to be held April 10. The amount of the subsidy is very much less than was asked for by the Utah Northern Company.

Milwaukee & Dubuque.

This company is said to be preparing to let contracts for the 65 miles of road from Milwaukee, Wis., to Janesville. For part of the distance an old graded road-bed is to be used.

Hampton & Fort Monroe.

The Virginia Legislature has passed a bill to incorporate this company for the purpose of building a railroad from Hampton to Fort Monroe, about four miles. There was, during the war, a railroad track covering most of the distance, which was built by the Government and used for the transportation of military stores. It was operated by mule-power, but was laid with heavy T-rail, and ordinary freight cars were used upon it.

Rutherford & Spartanburg.

This company has been duly organized in South Carolina, and has recently secured a charter from North Carolina. It purposes building a railroad from Rutherfordton, N. C., nearly due south to Spartanburg, S. C., about 38 miles. It is proposed to make it a narrow-gauge road.

Missouri Pacific.

The St. Louis Republican of Feb. 10 says: "In July, 1870, the City Council passed an ordinance allowing the Pacific Railroad to lay and operate a track on Poplar street until Jan. 1, 1872. Another ordinance was then passed extending the time on certain conditions to Jan. 1, 1873. Shortly afterward the company gave notice that it declined to accept the conditions of the new ordinance and proceeded to tear up a portion of the track. In a few weeks the company relaid the track, and the city immediately commenced suit to restrain it from using and operating the track. The suit never came to trial, however, but for some reason was dismissed by the city. In June, 1872, the Pacific road was leased to the Atlantic & Pacific Company, and the latter claimed that the Pacific road had a franchise to lay and track by its original charter, and that said franchise followed the lease. In July, 1873, the City Council passed an ordinance for the removal of the track; and the City Engineer, under the instruction of the Mayor, proceeded to remove it. The Atlantic & Pacific Railroad Company commenced suit in the Circuit Court for an injunction against the city restraining it from such action. A temporary injunction was granted,

which subsequently, on a trial of the cause, was made perpetual. From this judgment the city appealed, and on Monday the Court of Appeals rendered a decision reversing that of the Circuit Court and dissolving the injunction."

Tennessee Railroad Taxation.

In 1875 the Legislature of Tennessee, in order to settle some questions as to the liability of the railroads of the State to taxation, passed a law providing that any company which would agree to pay annually to the State 1½ per cent. of its gross earnings for ten years from Jan. 1, 1875, should be exempt from all other taxation, and the annual payment so made should be taken as in full of all taxation. This law was accepted by nearly all the companies of the State and payments have been made under it by most of them. Now, however, in the case of Sumner County against the Louisville & Nashville Company, the Supreme Court has decided that this law is unconstitutional and void. The only power of the Legislature under the State constitution is to provide the manner in which the assessment of railroad property shall be made.

Eastern Counties.

The line surveyed by the contractors for this road from New Glasgow, N. S., to the Straits of Canso has not yet been approved by the Government. The line as located is the easiest to build of any proposed, but meets with much local opposition, as it avoids several towns through which the road was expected to pass.

Train Accidents in January.

Very early on the morning of the 1st an express train on the Central Railroad of Georgia ran into a land-slide near Vineville, Ga., and the engine and three cars were thrown from the track and badly wrecked. Three trainmen and seven passengers were injured.

On the morning of the 1st a Wabash freight train, consisting of an engine and caboose met a Chicago, Burlington & Quincy passenger train on the track of the last named road, near Quincy, Ill. Both engines and the mail car were badly wrecked and the track blocked 14 hours. The freight conductor and brakeman were killed, the freight engineer, the passenger engineer and fireman were hurt. The accident was caused by a misunderstanding of orders either by the freight conductor or the dispatcher, to which reference has been made in several letters in the Railroad Gazette recently.

On the 1st, as the mail train on the Rutland Railroad was stopping at Healdville, Vt., a snow-plow ran into its rear end, wrecking a passenger car and injuring four men on the plow.

On the afternoon of the 1st, 15 cars of a freight train on the Missouri Pacific road ran off the track near Morrison, Mo.

On the afternoon of the 1st a car of a freight train on the Little Miami road was thrown from the track and wrecked by a broken wheel near Plain City, O.

On the afternoon of the 1st, as an engine on the Illinois Central road was going down the incline at Cairo, Ill., it became unmanageable and ran down at a high speed upon the transfer boat at the foot of the incline and into a coal car on the boat. Both engine and car were badly broken.

On the night of the 1st the engine and baggage car of a train on the Jeffersonville, Madison & Indianapolis road jumped the track in the yard at Indianapolis, Ind.

Early on the morning of the 2d the engine of a freight train on the Erie Railway ran off the track in a snow-drift at Passaic, N. J.

On the 2d a passenger train on the Memphis & Charleston road was thrown from the track by a broken rail near Tusculum, Ala., and two passengers were hurt.

On the 2d the engine of a freight train on the Boston & Albany road ran off the track in a snow-drift near Natick, Mass., blocking the road some time.

Early on the morning of the 3d, as a freight train on the Marietta & Cincinnati road was stopping for water at Vienna, O., a following freight train ran into its rear, breaking several cars badly and driving the rest forward upon a trestle, the engine of the first train being thrown over and off the trestle. The wreck caught fire and was burned, with part of the trestle and a number of hogs. It is said that the first train had sent no signal back when it stopped.

Early on the morning of the 3d seven cars of a freight train on the Missouri Pacific road were thrown from the track by a broken rail near South Point, Mo., blocking the road five hours.

On the afternoon of the 3d the engine of a freight train on the North Carolina Railroad was thrown from the track near Goldsboro, N. C., by ice upon the track, blocking the road several hours.

On the evening of the 3d several cars of a coal train on the Erie Railway ran off the track in the Bergen tunnel, delaying trains two hours.

On the morning of the 4th, as a local engine and passenger car was going through the Erie yard at Buffalo, N. Y., it ran into the head of a shifting engine which was coming out of a siding. Both engines were badly damaged and the engineer of the local train was jammed up against the boiler and so badly scalded that he died next day. Five trainmen were slightly hurt.

On the morning of the 4th a sleeping car of an express train on the Cincinnati, Lafayette & Chicago road was thrown from the track by a broken rail at Waldron, Ill., blocking the road six hours. One man was slightly hurt.

On the morning of the 4th a wild engine and snow-plow on the Boston & Albany road ran into the head of a freight train at East Brookfield, Mass., wrecking the plow and damaging one engine badly.

On the morning of the 4th an express train on the Grand Trunk Railway was thrown from the track in a heavy snow-drift near Gilead, Me., damaging the engine and four cars, injuring the fireman fatally and four other trainmen less severely.

On the 4th several stock cars of a train on the Quincy, Missouri & Pacific road were thrown from the track by a broken axle near West Quincy, Mo., killing a lot of sheep.

On the 4th a snow-plow and engine on the New Brunswick Railway ran off the track in a snow-drift near Gibson, N. B.

On the night of the 4th a freight train on the Chicago, Rock Island & Pacific road jumped the track near Buffalo Rock, Ill., blocking the road some time.

On the 5th the engine of a freight train on the New York Central & Hudson River road ran off the track in a snow-bank at Lyons, N. Y., and upset, injuring the fireman.

On the 5th an engine on the Southern Central road ran into a caboose which was standing on the track at Owego, N. Y., doing some damage.

About noon on the 5th an express train on the Cincinnati, Hamilton & Dayton road ran off the track near Hamilton, O., wrecking several cars.

On the afternoon of the 5th an express train on the New York Central & Hudson River road struck some freight cars which were being switched across the track on a short branch near Cold Spring, N. Y. The engine was damaged and a freight car cut in two. It is said that the usual signal was not displayed.

On the afternoon of the 5th a wood train on the Savannah & Charleston road ran off the track near Savannah, Ga., blocking the road several hours.

On the morning of the 6th a freight train on the North Carolina Railroad broke in two near Brassfield, N. C., and the rear section afterward ran into the forward one, damaging several cars and injuring the engineer slightly.

About noon on the 6th an express train on the Pennsylvania Railroad ran off the track in West Philadelphia. The engine and some freight cars on an adjoining siding were badly damaged and three trainmen hurt.

On the 6th the engine and a car of a coal train on the Seattle Coal Railroad ran off the track at Newcastle, Wash. Ter., and a brakeman was hurt.

On the evening of the 6th a mixed train on the Richmond & Danville road struck a broken rail near Tomahawk, Va., and ten loaded freight cars ran off the track and down a steep bank. The cars were badly broken, one brakeman killed and another hurt.

On the evening of the 6th a passenger train on the Connecticut River road was thrown from the track by a broken switch-rod in Springfield, Mass. Two cars left the track and struck another car on a siding close by, damaging a car badly and injuring a passenger.

On the 7th a yard engine on the Erie Railway ran off the track in Salamanca, N. Y.

Soon after another was thrown off at the same place, both accidents being caused by ice on the rails.

On the afternoon of the 7th a freight train on the Leavenworth, Lawrence & Galveston road broke through a bridge near Willaville, Kan., and the engine and eight cars were wrecked, and two men hurt. A gang of men were repairing the bridge at the time and had put out signals, which, it is said, the trainmen failed to see.

On the morning of the 8th a mixed train on the Alabama & Chattanooga road struck a broken rail near Cuba, Ala., and the freight cars passed over safely, but the passenger car left the track and went down a high bank, landing upside down. There were six passengers in the car, all of whom were hurt, but none very badly.

On the 8th two engines on the New York Central & Hudson River road were thrown from the track in Syracuse, N. Y., by snow piled up on the track. It had been thrown there by people on the adjoining street, because, in clearing the track with a snow-plow, the snow had been piled up on the carriage way, making it impassable. The road was blocked three hours.

On the afternoon of the 8th a mail train on the Rutland Railroad was thrown from the track by a broken rail near East Wallingford, Vt. Two cars went down a high bank and were badly broken, injuring seven passengers.

On the evening of the 8th the engine of a passenger train on the Indianapolis, Cincinnati & Lafayette road was thrown from the track by a misplaced switch in the yard at Indianapolis, Ind.

The engine was replaced and had gone but a very short distance when it was again thrown off by another misplaced switch and two cars followed it, this time blocking the track three hours. Both switches are believed to have been purposely misplaced.

Early on the morning of the 9th a passenger train on the Chicago, Burlington & Quincy ran into the rear of a freight train near Mendota, Ill., damaging the engine and several cars and injuring the engineer badly.

On the morning of the 9th an engine on the New York Central & Hudson River road ran into the rear of a freight train near Syracuse, N. Y., damaging an engine and a caboose.

On the morning of the 9th there was a butting collision between two freight trains on the Ohio & Mississippi road on a curve near Logansport, Ind. Both engines were completely wrecked, several cars damaged, three men who were on the west-bound engine killed and two on the east-bound engine hurt. It is reported that the accident was caused by a mistake in orders.

On the morning of the 9th the engine of a passenger train on the Boston, Concord & Montreal road ran off the track near Lancaster, N. H., and was badly damaged.

On the morning of the 9th two freight, a baggage and a passenger car of a mixed train on the Quincy, Missouri & Pacific road were thrown from the track by a broken flange on a car wheel. The road was blocked 15 hours.

On the afternoon of the 9th as a coal train on the Erie Railway was near Pond Eddy, N. Y., one connecting rod broke and the piston drove forward through the cylinder-head breaking it. The pump and crosshead were also broken.

On the evening of the 9th a train on the Pensacola Railroad was thrown from the track by a loose rail near Pensacola, Fla., the engine being upset in the ditch and five cars wrecked. The fireman was killed and the engineer badly hurt. The coroner's jury, after an investigation, brought in a verdict of malicious interference with the track.

On the morning of the 10th a passenger train on the Richmond Branch of the Louisville & Nashville road ran off the track near Gilbert's, Ky., and the baggage and passenger cars upset and were slightly damaged, injuring eight passengers, none very badly. The accident is said to have been caused by snow on the track.

On the morning of the 10th an express train on the Jeffersonville, Madison & Indianapolis road ran into a land-slide near Jonesville, Ind., and the engine and three cars were thrown from the track.

On the morning of the 10th the rear car of a passenger train on the Housatonic road was thrown from the track near South Lee, Mass., by a broken axle, and upset down a bank.

On the 10th a snow plow on the Utica Division of the Delaware, Lackawanna & Western road was thrown from the track in Utica, N. Y., by the breaking of a switch rod.

On the 10th an engine on the Syracuse & Chenango road ran off the track in a snow-bank at DeWitt Centre, N. Y.

On the 10th a passenger train on the Lexington & Big Sandy road ran off the track near Star Station, Ky., injuring the engineer and four passengers.

On the evening of the 10th a passenger train on the Erie Railway ran over a misplaced switch and into the head of a freight train which was standing on a siding at Bergen, N. J. Both engines were much damaged and two trainmen hurt.

On the night of the 10th a flat car of a New Jersey & New York freight train ran off the track on the Erie track near Penhorn, N. J., delaying trains two hours.

Early on the morning of the 11th a passenger train on the Washington City, Virginia Midland & Great Southern road struck a broken rail at Kettle Run bridge, near Bristoe, Va., and the two rear cars went off the track and down a bank, both of them turning over and one being badly broken. Two persons were badly and 13 slightly hurt.

On the morning of the 11th a car of a passenger train on the Chesapeake & Ohio road ran off the track near Roncoveerte, W. Va., and went down a high bank upon the ice in the Greenbrier River below. The car was badly broken and seven passengers hurt.

On the morning of the 11th a special train on the Jacksonville, Pensacola & Mobile road, having a circus on board, struck a broken rail near Live Oak, Fla., and seven cars were thrown from the track, some of them being badly broken. Several horses were killed and an elephant hurt.

On the 11th an axle broke under a coal car in a train on the Pennsylvania & Delaware road, near Avondale, Pa., and 12 cars were piled up and badly broken.

On the 11th a Mobile & Ohio freight train ran into a Nashville, Chattanooga & St. Louis passenger train at the crossing of the two roads in Union City, Tenn. Both engines were damaged and a trainman hurt.

On the afternoon of the 11th a car of a freight train on the Erie Railway ran off the track at Red Rock, near Great Bend, Pa.

Shortly afterwards a passenger train came up and ran into the rear of the freight, damaging the engine, wrecking and setting fire to the caboose and breaking two other cars. One

man was somewhat hurt. The freight conductor had sent back a flag, but it was not seen.

On the afternoon of the 11th, as a passenger train on the New York Central & Hudson River was near Croton, N. Y., one of the parallel rods of the engine broke, doing some damage and delaying the train nearly an hour.

On the night of the 11th several cars of a freight train on the Mobile & Montgomery road were thrown from the track near Pollard, Ala.

On the 12th a passenger train on the Emlenton & Shippenville road ran into the rear of a freight train near Emlenton, Pa., damaging several cars.

Near midnight on the 12th a freight train on the New York Central & Hudson River road was stalled in a snow-bank near Whitesboro, N. Y., and the two engines left it and ran to Utica for water. Returning, one of the engines ran off the track in the snow and blocked the track some time.

On the morning of the 13th an express train on the Maine Central road ran into a snow-plow and engine near Burnham, Me., and the plow was wrecked.

On the 13th a car of a coal train on the Intercolonial road was thrown from the track by a broken wheel near Humphrey's Mills, N. B.

Shortly after, a following freight train came up and ran into the coal train, wrecking the caboose and two coal cars. The coal-train conductor had sent back a brakeman with a signal, but he went into a house to warm himself and allowed the freight to pass.

On the 13th the engine of a train on the East St. Louis & Carondelet road ran off the track in East St. Louis, Ill. The fireman jumped and was hurt.

On the afternoon of the 13th a freight train on the St. Paul & Pacific road ran off the track near Minneapolis, Minn., blocking the track several hours.

On the night of the 13th a special passenger train on the St. Louis, Kansas City & Northern road struck a broken rail near Warrenton, Mo., and two cars left the track, injuring five men slightly.

On the morning of the 14th, in Augusta, Ga., there was a butting collision between a Port Royal passenger train and a Georgia Central switching engine, by which both engines were somewhat damaged.

On the morning of the 14th a freight train on the Jeffersonville, Madison & Indianapolis road was thrown from the track in Jeffersonville, Ind., by a misplaced switch.

On the morning of the 14th as a snow-plow and several engines on the Buffalo, New York & Philadelphia road were working through a drift near Buffalo, N. Y., one of the engines got off the track and the fireman got caught between the engine and tender and so crushed that he died in a few hours.

On the morning of the 14th there was a butting collision between two Lake Shore freight trains on the Erie & Pittsburgh road, near Albion, Pa.

On the evening of the 14th two engines and a snow-plow on the New York Central & Hudson River road ran into two passenger cars filled with men who had been shoveling snow, which had broken loose from a work train near Byron, N. Y. One of the cars was wrecked, killing two men and injuring three others.

On the night of the 14th an engine on the Erie Railway broke a tire near Hunt's, N. Y., and was thrown from the track.

Late on the night of the 14th several cars of an express train on the South Carolina Railroad ran off the track at Nine-mile Bottom, S. C., and were slightly damaged, blocking the road seven hours.

Very early on the morning of the 15th one of the engines of an express train on the New York Central & Hudson River road ran off the track in a snow-drift near Fonda, N. Y., and was badly damaged.

On the morning of the 15th the pay train on the New York Central & Hudson River road ran into the rear of an extra freight at Highland, N. Y., wrecking two cars, damaging the engine, and injuring the engineman. The wrecked caboose caught fire, and was burned up.

On the 15th a trestle bridge over Flint Creek, Tenn., on the Winchester & Alabama road, gave way under a train, and the engine went down into the creek. The train was a special one with a party on board inspecting the road.

On the afternoon of the 15th a wild engine on the Erie Railway ran into the rear of a freight train near Passaic Bridge, N. J., wrecking the caboose.

On the evening of the 15th six engines and a snow-plow were thrown from the track in a very deep snow-drift near Lyell Road, N. Y., on the Charlotte Branch of the New York Central & Hudson River road.

On the night of the 15th a local train on the Erie Railway struck a car which had broken loose from a preceding train in the Bergen Tunnel. The engine was damaged and the engineman hurt.

On the night of the 15th a snow-plow and four engines on the Erie Railway ran off the track in a deep drift near Warsaw, N. Y., two of the engines being thrown across the track, in a very bad position, and the other two being upset in the ditch.

On the night of the 15th a car of a freight train on the Canada Southern road ran off the track near Welland, Ont., blocking the road several hours.

Very late on the night of the 15th three cars of a passenger train on the Missouri Pacific road ran off the track near Redmond, Kan., blocking the road until the next morning.

Very early on the morning of the 16th the five rear cars of a freight train on the St. Louis & Southwestern road ran off the track and down a bank near Roach's, Ill. The caboose caught fire from the stove and was burned.

Very early on the morning of the 16th the engine of a train on the Erie road was thrown from the track at Hunt's, N. Y., by ice on the rails.

On the morning of the 16th the locomotive of a freight train on the Providence, Warren & Bristol road was thrown from the track near Warren, R. I., by the breaking of a truck axle.

On the 16th the engine and two cars of an express train on the Michigan Central road ran off the track in a snow-bank near Calumet River, Ind., and a man who was stealing a ride was hurt.

On the afternoon of the 16th a passenger train on the Utica, Clinton & Binghamton road ran off the track in a snow-bank at Hamilton, N. Y.

On the evening of the 16th a freight train on the Utica Division of the Delaware, Lackawanna & Western road was thrown from the track near Utica, N. Y., by ice on the rails, blocking the road some time.

On the evening of the 16th a freight train on the Philadelphia & Reading road ran into the rear of a coal train near Mount Carbon, Pa., wrecking several cars and blocking the road two hours.

On the night of the 16th a freight train on the Missouri, Kansas & Texas road struck a misplaced rail near Vinita, Indian Ter., and the engine and ten cars were wrecked, injuring the fireman fatally and two brakemen less severely. The rail had been purposely misplaced, the fastenings having been removed. The men who did it were subsequently arrested.

On the morning of the 17th an express car in a train on the Erie Railway was thrown from the track near Shohola, Pa., by a broken wheel. The car was thrown with violence over against a freight train, which was just passing on the other track, damaging several freight cars and finally wrecking the caboose, injuring one passenger in it severely and two others slightly.

On the 17th two engines and a snow-plow on the Buffalo & Jamestown road ran off the track in a snow-bank, near Hamburg, N. Y., blocking the road a day.

On the 17th two cars of a passenger train on the Chicago & Iowa road were thrown from the track at Rochelle, Ill., by a broken truck, delaying the train six hours.

On the afternoon of the 17th the tender of a mail train on the Rutland Railroad was thrown from the track near Sutherland Falls, Vt., by the breaking of an axle, delaying the train three hours.

On the afternoon of the 17th the truck of the engine of a freight train on the Erie Railway jumped the track near the Portage Bridge, N. Y., and ran across the bridge on the floor.

On the morning of the 18th a passenger train on the Indianapolis & St. Louis road ran into a shifting engine near the depot in Terre Haute, Ind., damaging both engines and a baggage car and injuring a brakeman.

On the morning of the 19th a freight train on the New York Central & Hudson River road was thrown from the track by ice on the rails near Manlius, N. Y.

On the morning of the 19th two cars of a passenger train on the Erie Railway were thrown from the track near Basket Switch, N. Y., by a broken rail, delaying the train four hours.

On the 20th several cars of a passenger train on the Southern Minnesota road were thrown from the track by the breaking of an axle near Ramsey, Minn.

On the 20th a shifting engine in the California Pacific yard at Vallejo, Cal., ran into the rear of a passenger train, which was standing on the track, damaging a car slightly.

On the 21st, as an oil train on the Weehawken Branch of the Erie Railway was going up the grade at Weehawken, N. J., several cars broke loose and ran back down the grade. The cars jumped the track at a curve and ran into a small house near the track, wrecking themselves and demolishing the house.

On the evening of the 21st an express train on the Kansas Pacific road was thrown from the track by a broken rail near Manhattan, Kan. Two cars upset down a bank and two trainmen and five passengers were hurt. The road was blocked all night.

On the evening of the 22d, as a train on the Rensselaer & Saratoga road was near West Rutland, Vt., the tire on one of the driving wheels of the engine broke, part of it falling in the ditch and the other part being thrown under the baggage car. The train was delayed an hour.

On the night of the 22d the passenger car of a mixed train on the Wabash road ran off the track and upset near Hannibal, Mo., injuring five persons.

Early on the morning of the 23d a passenger train on the Louisville, Cincinnati & Lexington road was thrown from the track at Mill Creek, Ky., by a misplaced switch.

On the morning of the 23d, in a dense fog, a freight train on the Buffalo, New York & Philadelphia road ran into a preceding coal train, wrecking four cars and injuring two trainmen.

On the 23d an engine and three cars of a freight train on the Texas & Pacific road were thrown from the track near Marshall, Tex., and were badly damaged, killing a lot of cattle. Two trainmen were hurt.

On the evening of the 23d an express train on the Harlem Extension road struck a broken rail near Dorset, Vt., and several cars were thrown from the track and down a bank, injuring one passenger.

On the night of the 23d a passenger train on the Cincinnati, Sandusky & Cleveland road was thrown from the track by a broken rail near Plattsburg, O., damaging several cars and injuring the conductor.

On the morning of the 24th three cars of a freight train on the Cincinnati, Lafayette & Chicago road were thrown from the track near Waldron, Ind., blocking the road three hours.

On the morning of the 24th a passenger train on the Rensselaer & Saratoga road struck a broken rail near Granville, Vt., and two cars were thrown from the track and damaged slightly.

On the 24th an engine and snow-plow on the New York & New England road ran into the rear of a passenger train which was standing on the track at East Thompson, Conn., breaking two cars badly.

On the evening of the 24th a passenger train on the New York Central & Hudson River road ran into the rear end of a freight train which was trying to work through a snow-bank near Coldwater, N. Y., wrecking the caboose, and blocking the road six hours.

On the morning of the 25th as a freight train on the New York Central & Hudson River road was backing into a siding at Factory Village, N. Y., the engineman failed to stop in time, and the train struck some cars on the siding with such force that two were wrecked.

On the 25th several cars of a freight train on the Missouri, Kansas & Texas road were thrown from the track by a broken rail near Estelle, Mo.

On the 25th two cars of an express train on the St. Louis, Kansas City & Northern road were thrown from the track near Miami City, Mo., by a broken rail. Both cars are badly damaged.

On the night of the 25th a snow-plow on the Virginia & Truckee road ran off the track in a snow bank, near Carson, Nev.

On the night of the 25th a car of an express train on the Cincinnati, Lafayette & Chicago road was thrown from the track by a broken axle near Lafayette, Ind.

On the night of the 25th 15 cars of a freight train on the Houston & Texas Central road were thrown from the track near Ennis, Tex., blocking the road ten hours.

Early on the morning of the 26th the rear car of an express train on the Illinois Central road was thrown from the track by a broken axle near Kankakee, Ill. The car ran over a bridge on the ties before the train was stopped.

On the morning of the 26th a passenger train on the Indianapolis, Bloomington & Western road ran into the rear of a coal train in Peoria, Ill., damaging several coal cars, and injuring the engineman (who jumped) slightly. A signal was shown for the passenger train to come on.

On the 26th, as a passenger train on the Cleveland, Mt. Vernon & Delaware road was near Danville, O., one of the parallel rods broke, tearing out one side of the cab.

On the afternoon of the 27th an engine on the Maine Central road was thrown from the track by a misplaced switch in Bath, Me.

On the afternoon of the 27th the tender and one car of a freight train on the Utica, Clinton & Binghamton road ran off the track at Deansville, N. Y., injuring the conductor and a brakeman.

On the afternoon of the 27th the rear car of a mail train on the Grand Rapids & Indiana road jumped the track on a small bridge near Stanwood, Mich., and upset into the creek below, wrecking the car and injuring 11 persons.

On the evening of the 27th, as a passenger train on the Lake Shore & Michigan Southern road was near Mentor, O., one of the parallel rods of the engine broke and the loose end shattered one side of the cab and injured the fireman.

Late on the night of the 27th some cars of an express train on the Erie Railway were thrown from the track by a misplaced switch near Waverly, N. Y. They were quickly replaced, no damage being done. The switch had been purposely misplaced, and the train had passed a short distance back, an obstruction made by chaining heavy logs to the track, which had, however, been discovered by a trackman in time to flag the train. It was thought that the intention was to wreck and then rob the train, but the man who did it was caught and found to be insane.

On the 29th an engine on the Ohio & Toledo road was thrown from the track near Minerva, O., by ice on the rails.

On the 29th there was a butting collision between two coal trains on the Lehigh Division of the New Jersey Central, at Nesqueop Junction, Pa., by which both engines and 40 coal

cars were wrecked. It is said that the accident was caused by the issue of the wrong order to one of the trains.

On the evening of the 29th a freight train on the Intercolonial road was thrown from the track near Bedford, N. S., by a broken wheel and several cars were damaged.

On the night of the 29th a freight train on the Boston, Concord & Montreal road was thrown from the track near West Rumney, N. H., by the breaking down of an overloaded car.

On the night of the 29th several freight cars on the Missouri Pacific road ran off the track in Leavenworth, Kan.

On the morning of the 30th the second section of a freight train on the Lehigh Valley road ran into the first section, which had stopped at Allentown, Pa. The engine of the second section went through three cars of the first and 23 cars of its own train were piled up on it and badly broken, and several were thrown over on an adjoining building, knocking down one side of it. It is said the wreck was piled up so high as to break the telegraph wires. There was a thick fog at the time.

On the 30th some cars of a coal train on the Chicago, Rock Island & Pacific road ran off the track at Eldon, Ia., blocking the road some time.

On the evening of the 30th a freight train on the New York Central & Hudson River road ran into the rear of a preceding freight, which had stopped near Byron, N. Y., to cool a hot journal. The engine and several cars were completely wrecked.

On the night of the 30th nine cars of a freight train on the Wallkill Valley road were thrown from the track by a broken rail near Walden, N. Y.

On the morning of the 31st the engine of a freight train on the New York Central & Hudson River road exploded its boiler near Holley, N. Y., wrecking the engine and killing the fireman.

On the 31st a freight train on the Central Railroad of Georgia ran into a landslide near Andersonville, Ga., wrecking the engine and several cars and injuring the conductor.

On the afternoon of the 31st the engine and four cars of a freight train on the Southwestern Division of the Chicago, Rock Island & Pacific were thrown from the track near Platte City, Mo., and a brakeman was hurt.

Late on the night of the 31st a freight train on the Chicago & Northwestern road ran over a misplaced switch and upon the siding leading to the turn-table at Waukegan, Ill. The engine went down into the turn-table pit and three cars were piled up on top of it and badly broken, the turn-table also being broken up.

Very late on the night of the 31st a passenger train on the Delaware, Lackawanna & Western road ran over a misplaced switch and into some coal cars standing on a siding at Bloomfield, N. J., damaging several cars badly.

This is a total of 147 accidents, whereby 14 persons were killed and 148 injured. Ten accidents caused death, 39 injury less than death and 98, or two-thirds of the whole, caused no injury serious enough for record.

These accidents may be classed as to their nature and causes as follows:

COLLISIONS:		
Rear collisions.....	24	
Butting collisions.....	11	
Crossing collisions.....	2	
		37
DERAILMENTS:		
Unexplained.....	30	
Snow or ice.....	24	
Broken rail.....	17	
Broken axle.....	8	
Misplaced switch.....	7	
Broken wheel.....	5	
Land-slide.....	3	
Broken switch rod.....	2	
Broken bridge.....	2	
Broken tire.....	1	
Broken truck.....	1	
Broken coupling.....	1	
Broken-down car.....	1	
Rail misplaced purposely.....	2	
		104
Broken connecting rod.....	4	
Broken tire.....	1	
Boiler explosion.....	1	
		147

Six collisions were caused by want of or failure to use signals; three by trains breaking in two; three by mistake or misunderstanding of orders; two by misplaced switches; two by fog; one by snow and one by a runaway engine. Of the two broken bridges reported, one was a wooden truss bridge and was receiving repairs at the time, and one was a wooden trestle which failed, singularly enough, under a train carrying a party to inspect the road. Three switches are recorded as purposely misplaced. Forty-eight accidents resulted directly from defect or failure of road or equipment. Of the 104 derailments, 45 were of passenger and 59 of freight or service trains; 21 collisions were between a freight and a passenger, and 16 between two freight trains; of the six other accidents, four happened to passenger and two to freight trains.

Compared with January, 1876, there was an increase of 87 accidents, of two in the number killed, and of 119 injured.

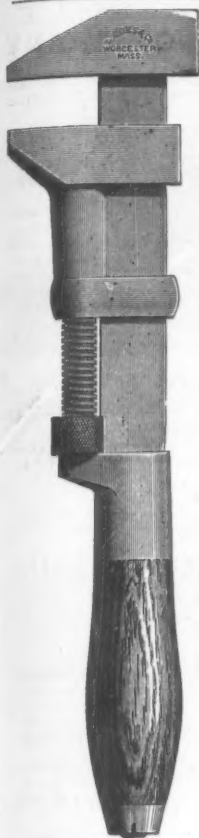
The unusual number of accidents is fully explained by the weather. The month was one of intense cold and severe storms, and several of those storms spread over an unusual extent of country, blocked roads and snow-drifts being recorded as far south as Eastern North Carolina, where an inch of snow is considered an unusually heavy fall. Besides the accidents resulting from snow directly, many broken rails, wheels and axles are recorded, the usual results of a hard-frozen road-bed, and some collisions may be traced to the confusion incident to a snow-blocked road. The most severe storms were felt in Central and Western New York, and there the greatest number of accidents are recorded.

The number of killed is not large, snow accidents not being very often fatal.

For the year ending with January the record is as follows:

	No. of accidents.	Killed.	Injured.
February.....	91	15	96
March.....	109	20	96
April.....	56	6	47
May.....	54	13	116
June.....	52	19	73
July.....	79	17	69
August.....	78	22	133
September.....	106	41	118
October.....	103	40	135
November.....	96	24	141
December.....	88	10	146
January.....	147		
Totals.....	1,069	330	1,216

The averages per day for the month were 4.74 accidents, 0.32 killed, and 4.77 injured; for the year they were 2.92 accidents, 0.90 killed and 3.32 injured. The average casualties per accident were for the month, 0.068 killed and 1.007 injured; for the year, 0.3 09 killed and 1.138 injured.



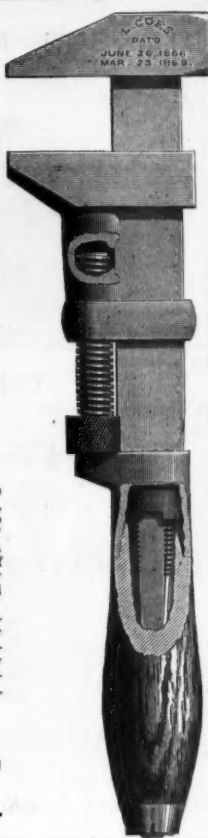
L. COES'
GENUINE IMPROVED PATENT
Screw Wrenches
MANUFACTURED BY
L. COES & CO.,
Worcester, Mass.



We invite the particular attention of the trade to our New Straight Bar Wrench, widened, full size of the larger part of the so called Lindsay's "REINFORCED OR JOG BAR." Also our enlarged jaw, made with ribs on the inside having a full bearing on front of bar (see sectional view), making the jaw fully equal to any strain the bar may be subjected to.

These recent improvements in combination with the nut inside the ferrule firmly screwed up flush, against square, solid bearings (that cannot be forced out of place by use) verifies our claim, that we are manufacturing the strongest Wrench in the market. None genuine unless stamped

"L. COES & CO."
Warehouse, 97 Chambers and 81
Rende Streets, New York.
HORACE DURRIE & CO., Agents.



RICHARD DUDGEON.
24 COLUMBIA ST., NEW YORK.
MAKER AND PATENTEE
OF IMPROVED
HYDRAULIC JACKS.



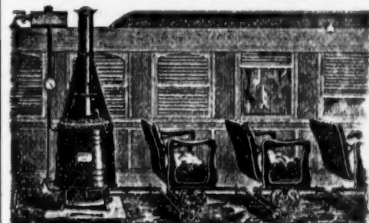
Punches,
Roller - Tube
Expanders, &
Direct-Acting

STEAM HAMMERS.
Communications by letter will
receive prompt attention.

**JACKS FOR PRESSING ON CAR-WHEELS
OR CRANK PINS MADE TO ORDER.**



BAKER'S PATENT CAR WARMER.



Hot Water Pipes at the Feet of
Each Passenger.
Full Descriptive Pamphlets Furnished on Applica-
tion.

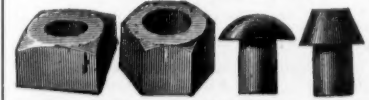
BAKER, SMITH & CO.
Cor. Greene & Houston sts., | 81 & 83 Jackson st.
NEW YORK. | CHICAGO.



HOOPES & TOWNSEND,
MANUFACTURERS

machine and Car Bolts, Wood Screws, Cold-Punched
square and Hexagon Nuts, Washers, Keystone
Boiler Rivets, Tank Rivets, Railroad Track Bolts,
Chain Links, Car Irons, Bridge Bolts, Bridge Irons
Rods and Bolts for Buildings, &c.,

No. 1330 Buttonwood st., Phila.



PENNSYLVANIA STEEL COMPANY,
MANUFACTURERS OF THE



**STEEL-RAIL RAILROAD HAMMERED STEEL RAILS
FROGS AND CROSSINGS, AND STEEL FORGINGS.**



SAMUEL M. FELTON, President.

EBEN F. BARKER, Secretary. **L. S. BENT, Superintendent.** **HENRY C. SPACKMAN, Treasurer.**
OFFICE: 316 South Fourth Street, Philadelphia. WORKS: Baldwin Station (Near Harrisburg), Pa.



The rail flanges being bolted vertically between heavy horizontal plates, the load is taken directly by the bolts, and the rails are supported on their bases, instead of being hung "by the ears" on the narrow edges of fish bars. As there are no cross strains on these vertical bolts, no "washers" or rubber inventions are required to keep the nuts tight. The FISHER system of fastening admits the use of any form to the head of the rail, and, by smoothness of track, preservation from battering of ends of rails, and little care required, gives the most durable and economical joint yet devised. They have been in extensive use on many important roads for from four to thirteen years past. Further information will be furnished by the manufacturers, FISHER & NORRIS, Trenton, N. J.

C. A. HOTCHKISS
PHILIP GAYLORD.

EMPLOYMENT.

[Advertisements of situations wanted or of officers or employees wanted will be inserted under this heading for TWO CENTS PER WORD for the first publication and ONE CENT PER WORD for each subsequent insertion. Payment must be made in advance. Letters forwarded.]

POSITION DESIRED BY A CIVIL ENGINEER. expert in locating and rearranging alignment and grades for present economical construction, and especially future economical operation. Skilled in practical mechanical detail of planning and constructing railway works and machinery. United States and Spanish-American experience. Speaks Spanish. Address: ECONOMICAL OPERATION, Railroad Gazette office.

ASSISTANT SUPERINTENDENCY OR Mastership of Roadway and Machinery desired by an engineer, practical, progressive and systematic in economical railroad operation. Address: ASSISTANT SUPERINTENDENT, this office.

ENGAGEMENT DESIRED BY AN ENGINEER with a thorough technical education, and experience in designing Iron Bridges, Roofs and Special Machinery. Was one of the inspectors of the St. Louis Bridge. Address: C. S. D., P. O. Drawer 9, Wolcott, N. Y.

WANTED.—A FIRST-CLASS, EXPERIENCED business man as Travelling Salesman, to sell Railroad and Manufacturing Supplies. Address: stating reference, experience and salary required—"Manufacturer," Railroad Gazette office, 73 Broadway, New York.

A MACHINIST, WITH A GOOD SCIENTIFIC education, desires a situation as Foreman in a Railroad Repair Shop. Has always been employed on Locomotive work. Can give references if desired. Address "Machinist," office of RAILROAD GAZETTE, 73 Broadway, New York.

POSITION DESIRED ON SOME LIVE Railroad. Am well posted as to general Railroad Accounts and the Freight traffic. Railroad managers desiring an energetic and competent man will address "AUDITOR," Railroad Gazette Office, 73 Broadway, New York.

WANTED.—A SITUATION AS SHORT- hand writer for some railway official. 6 years' experience. GEO. F. BENEDICT, Litchfield, Mich.

WANTED.—SITUATION BY A ME-chanical Draughtsman of twenty years' experience, four years of which he has been employed exclusively on iron bridges and roofs. Has a knowledge of both theory and practice of American system of bridge construction and is familiar with railway work from driving the first stake to finished road. Can show designs covering his field of experience in engineering. Address "DESIGNER," 387 Cass avenue, Detroit, Mich.

WANTED. SITUATION AS FORE-MAN BOILER MAKER. Address "M. K.," Railroad Gazette office, 73 Broadway, N. Y.

TO RAILROAD OR COAL COMPANIES desiring to purchase land for coal docks. For sale a piece of land 380 ft. deep and with frontage of 82 ft. on S. I. Sound, within a quarter of a mile of the Easton and Amboy coal docks at Perth Amboy, N. J. Further particulars may be learned of JAS. L. FORD, office Railroad Gazette.

CROCKER'S TICKET PUNCH.

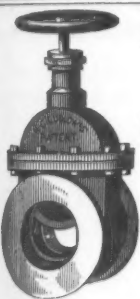
Patented April 30, 1867, and Sept. 21, 1869.



Suitable for any kind of tickets. My Punches are in use on many leading railroads, and have proved to be a durable article.

N. B.—Any punch with spiral springs to throw off tickets is an infringement on my patent. All persons are warned against purchasing them.

L. O. CROCKER,
Lock Box 17, Weymouth Landing, Mass.



LUDLOW VALVE MFG. CO.,

OFFICE AND WORKS:

938 to 954 River St. and 67 to 83 Vail Ave., Troy, N. Y.

VALVES

(Double and Single Gate, 1/2 in. to 48 in.—outside and inside Screws, Indicator, &c.) for Gas, Water and Steam. Send for Circular.

Also, FIRE HYDRANTS.



PEET VALVE COMPANY

153 Hampden Street, Boston, Mass.,

MANUFACTURERS OF

Quick-opening Valves,

FOR

RAILROAD WATER TANKS;

Also Valves for Steam, Water, Gas, &c.

In use on the BOSTON & ALBANY; BOSTON, CLINTON & FITCHBURG; NEW YORK & NEW ENGLAND, and other roads.

CHERRY HEAT WELDING COMPOUND.



SCHIERLOH MANUFACTURING COMPANY,
Office, 24 Exchange Place,
Jersey City, N. J.



OFFICE OF PURCHASING AGENT,
Lake Shore & Michigan Southern R'y.,
Cleveland, O., March 1, 1876.

IRON CLAD PAINT CO., Cleveland, O.

Gentlemen—Your "Metallic Paints," known as "Iron Clad Paints," have in the past nine years been extensively used and thoroughly tested by this Company as to their covering capacity, durability and resistance to atmospheric changes. Later "paint destroyers" the most difficult to overcome in outside paints. We have used over 100 tons and can emphatically accord them the highest position over any paint heretofore produced for Cars, Roofs, Stations, Bridges, &c. The monthly increase of our orders is the best evidence that your paint is constantly growing in favor with our mechanics.

Very respectfully yours,

A. C. ARMSTRONG

Gen'l. Purchasing Agent,
L. S. & M. S. R'y. Co.

THE EDGAR THOMSON STEEL CO., LIMITED, MANUFACTURERS OF



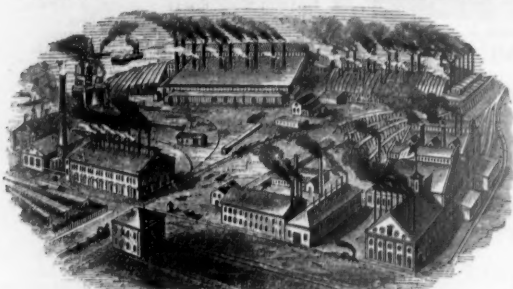
General Office and Works at Bessemer Station (Penn. R.R.), Allegheny County, Pa.

New York Office, No. 57 Broadway.

The members of the Edgar Thomson Steel Company, Limited, have had large experience in manufacturing and in railway management; their works are the most complete in the world, with all the late improvements, and are located in the best Bessemer metal district in the United States, and their managing officers are experienced in the manufacture of Bessemer Steel. The Company warrants its rails equal in quality to any manufactured in the United States. Rails of any weight or section furnished on short notice. Orders for trial lots solicited.

Branch Office and P. O. Address,  No. 41 Fifth Ave., Pittsburgh, Pa.
D. McCANDLESS, Chairman. WM. P. SHINN, General Manager.

NORTH CHICAGO ROLLING MILL COMPANY,



MANUFACTURERS OF
PIG METAL, IRON RAILS,
AND
Bessemer Steel Rails.
OFFICE:
17 Metropolitan Block,
CHICAGO.

O. W. POTTER, President.
S. CLEMENT, Treasurer.
R. C. HANNAH, Secretary.

Established - - 1857.
Incorporated - - 1869.

CAPITAL, \$3,000,000.

WORKS OF THE NORTH CHICAGO ROLLING MILL COMPANY.
The Company possesses facilities for the production of Iron and Steel Rails in BEST QUALITIES. Any of the usual patterns of rails supplied on short notice. New patterns will be made to order. Capacity of Works, 50,000 tons Iron and 50,000 tons Steel per annum.



Orders Solicited for Iron Rail
Of any Weight not Less than 30 lbs. per yd.

RE-ROLLING PROMPTLY DONE

On the Most Favorable Terms.

The Iron Rail Piles made by this Company are all heated with Siemens' Gas Furnace, thereby securing perfect welds.

CHARLES RIDGELY, President.
JOHN W. BUNN, Vice-President.
GEO. M. BEINKERHOFF, Sec'y.

Capacity of Works 3,000 Tons per Month.

THE ALBANY & RENSSELAER IRON & STEEL CO.

ERASTUS CORNING, Pres.; CHESTER GRISWOLD, V. Pt.;
SELDEN E. MARVIN, Sec'y & Treas.; JAMES E. WALKER, Gen'l Manager.

TROY, N. Y.

NEW YORK OFFICE, 56 BROADWAY.

PROPRIETORS OF

The Albany Iron Works, The Rensselaer Iron Works, The Bessemer Steel Works, The Fort Edward Blast Furnace, The Columbia Blast Furnace.

Manufacturers of Bessemer Steel and Iron Rails, Fish-Plates, Bolts and Nuts for Fish-Joints, Railroad Frogs, Railroad, Boat and Ship Spikes. All sizes Merchant and Angle Iron, Merchant, Bar and Spring Steel, Bessemer Steel Shafting, Crow-Bar and Cut and Clinch Nails, Boiler Rivets, Finger Bars and Shapes, Railroad Car, Truck and Engine Axles.

WALKER'S PATENT IMPROVED HORSE-SHOES.

We refer with especial pleasure to the quality of the articles manufactured by us, and warrant the same equal to any other manufactures in the United States.

All orders addressed to us will receive prompt attention.

THE STANDARD STEEL WORKS.

Locomotive and Car-Wheel Tires

Manufactured from the celebrated OTIS STEEL.

BRAND

STANDARD.

Quality and efficiency fully guaranteed. Prices as low as any of the same quality. We also manufacture

Heavy and Light Forgings, Driving and Car Axles, Crank Pins, Piston Rods, &c., &c.

Works at Lewistown, Pa. Office, 218 S. 4th St., Philadelphia, Pa.

THE CAMBRIA IRON WORKS,

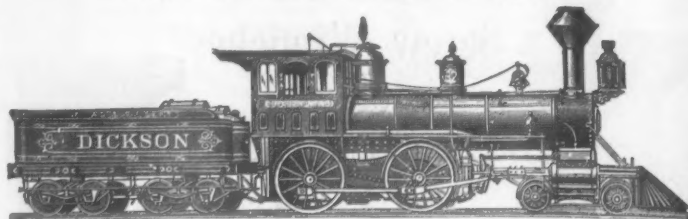
Situated on the line of the Pennsylvania Railroad, at the western base of the Allegheny Mountains, are the largest of their class in the United States, and are now prepared to make 2,000 tons per week of Iron and Steel Railway Bars.

The Company possesses inexhaustible mines of Coal and Ore, of suitable varieties for the production of Iron and Steel Rails of BEST QUALITY.

Their location, coupled with every known improvement in machinery and process of manufacture, enables them to offer Rails, when quality is considered, at lowest market rates. Address CAMBRIA IRON COMPANY, No. 218 South Fourth street, Philadelphia, or at the Works, Johnstown, Pa., or J. S. KENNEDY & CO. Selling Agents, No. 41 Cedar street, New York.

DICKSON MANUFACTURING COMPANY

Scranton and Wilkesbarre, Pa.



Manufacturers of Locomotives adapted to every kind of service. Pumping and Mining Machinery a specialty. Cars, Car Wheels, Forgings and Machinery of all kinds. Specifications promptly furnished on application.

GENERAL OFFICE, Scranton, Pa.

G. L. DICKSON, President.

W. H. PERKINS, Treasurer.

W. B. CULVER, Gen. Sup't

THE CLEVELAND ROLLING MILL COMPANY,

CLEVELAND, OHIO,

MANUFACTURERS OF

Bessemer Steel and Iron Rails,

From 25 lbs. to 70 lbs. per yard,

AND FASTENINGS,

BOILER PLATE, TIRE, AXLES AND OTHER FORGINGS,

Of Siemens-Martin and Bessemer Steel, and of Iron.

Galvanized and Black Sheet Iron.

CORRUGATED ROOFING AND SIDING.

SPRING STEEL AND WIRE OF ALL KINDS.

WIRE CLOTH.

Agents for the Sale of Steel Screws of all Sizes.

Using Lake Superior Iron Ore, from its own mines, and having a long experience in manufacturing, company can warrant the quality of its products.

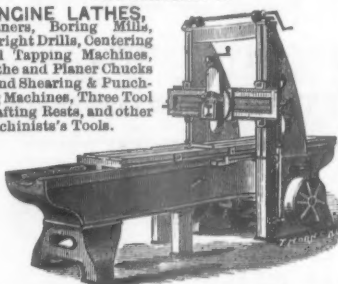
A. B. STONE, President, 20 Nassau st., New York.

H. CHISHOLM, Vice-Pres. and Gen. Manager, Cleveland, O.

EDWIN HARRINGTON & SON,

MANUFACTURERS OF

ENGINE LATHES,
Planers, Boring Mills,
Upright Drills, Centering
and Tapping Machines,
Lathe and Planer Chucks,
Hand Shearing & Punching
Machines, Three Tool
Shafting Rests, and other
Machinists' Tools.



Corner North 15th St. and Pennsylvania Avenue, Philadelphia, Pa.

MORSE TWIST DRILL
AND MACHINE COMPANY,
MANUFACTURERS OF



TAPS, DIES, SCREW PLATES, Etc.

These tools are furnished with V or U. S. standard shape of threads and any desired pitch or number of threads per inch. Having completed our special gauges and machinery for making the U. S. or Flat Top and Bottom of thread, we invite attention of R. R. men to our manufacture of long shank or nut taps, which we in all cases guarantee against imperfections such as fire cracks, temper or gauge. For descriptive circular of Machinists', Blacksmith, Pipe and other taps, and screw plates, etc., send to

H. S. MANNING & CO.,

Sole agents for the sale of above tools,
111 LIBERTY STREET, NEW YORK.

CAST STEEL WORKS

OF FRIED. KRUPP,

Essen, Rhenish Prussia.

TIRES, AXLES SPRING STEEL,

Crank Pins, Connecting Rods, Piston Rods, Boiler Plates, &c., &c.

Special Tool Steel,

A Very Superior Article, Suitable for All Kinds of Cutting Tools, Dies, &c.

Represented by

THOS. PROSSER & SON,
15 Gold street, New York.

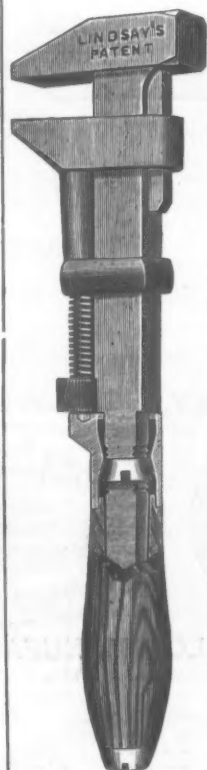
DEAD-STROKE POWER HAMMERS.

Improved Hydraulic Jacks,

Manufactured by

PHILIP S. JUSTICE,
PHILADELPHIA, PA.

THE CELEBRATED LINDSAY WRENCH.



The Lindsay Wrench was very favorably received by the Master Mechanics when first introduced.

We have added the "Coes" improvements to that of Lindsay, and claim to make now the strongest wrench known.

Manufactured under

John F. Lindsay's Patent, Dec. 12, 1865.

A. G. Coes' Patent, May 2, 1871.

A. G. Coes' Patent, Dec. 26, 1871.

F. L. Coes' Patent, Aug. 1, 1876.

Manufactured expressly for Railroad use.

A. G. COES & CO., Worcester, Mass.

PHOSPHOR BRONZE SMELTING WORKS.

C. J. A. DICK, Proprietor,
2038 WASHINGTON AVENUE, PHILADELPHIA, Pa.
Patentee and sole manufacturer of Phosphor Bronze in the United States.

REGISTERED TRADE MARK:



"Phosphor Bronze."

Several principal railway corporations are using Phosphor Bronze bearings exclusively. Particulars on application at the works, or to licensed founders: GEO. K. TAYLOR, Callowhill, west of Broad street, Philadelphia; ARWOOD & McCARTHY, 50 to 60 Third avenue, Pittsburgh.

THE MASON MACHINE WORKS, TAUNTON, MASS.



WM. MASON, Pres.

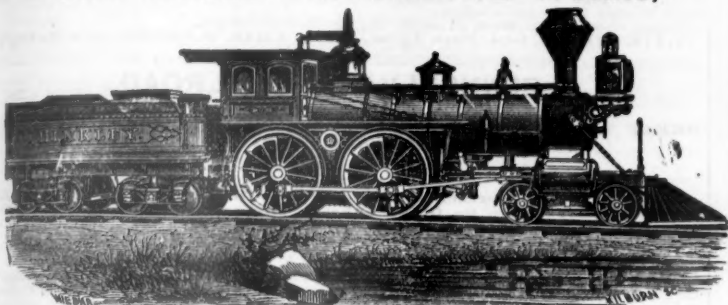
WM. H. BENT, Treas.

FRED'K MASON, Agent.

BUILDERS OF ALL KINDS OF

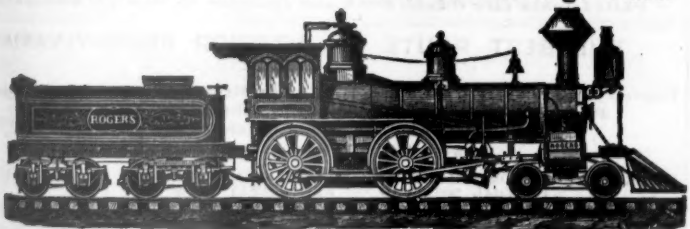
LOCOMOTIVES,INCLUDING DOUBLE-TRUCK LOCOMOTIVES FOR WIDE OR NARROW-GAUGE RAILROADS
ALSO ALL KINDS OF COTTON MACHINERY

THE HINKLEY LOCOMOTIVE WORKS,

439 ALBANY STREET, BOSTON,
MANUFACTURELocomotive Engines and Tenders, Boilers and Tanks,
Gun Metal and Common Iron Castings, Brass and Composition
Castings.**LOCOMOTIVES AND BOILERS REPAIRED.**Sole manufacturers of the "HINKLEY PATENT BOILER." All orders will be executed with
dispatch.ADAMS AYER, Pres't. F. L. BULLARD, Treas. FRANK D. OHILD, Sup't.
GEO. F. OHILD, Secretary. H. L. LEACH, General Manager.

ROGERS LOCOMOTIVE AND MACHINE WORKS

Paterson, N. J.; New York Office, 44 Exchange Place.



MANUFACTURERS OF

Locomotive Engines and Tenders and Other Railroad Machinery.

J. R. ROGERS, President.
R. S. HUGHES, Secretary. PATERSON, N. J.R. S. HUGHES, Treas.,
44 Exchange Place, New York.

TAUNTON LOCOMOTIVE MANUFACTURING CO.,



P. I. FERRIS, Supt.

[ESTABLISHED IN 1846.]

HARRISON TWEED, Treas.

TAUNTON, MASS.

MANCHESTER LOCOMOTIVE WORKS,



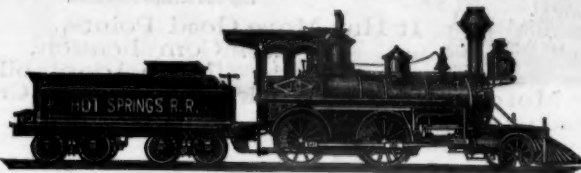
MANUFACTURERS OF LOCOMOTIVE ENGINES.

All work accurately fitted to gauges. All parts duplicated and guaranteed of best material and work.
JOHN A. BURNHAM, President.
WM. G. MEANS, Treas., Boston, Mass.

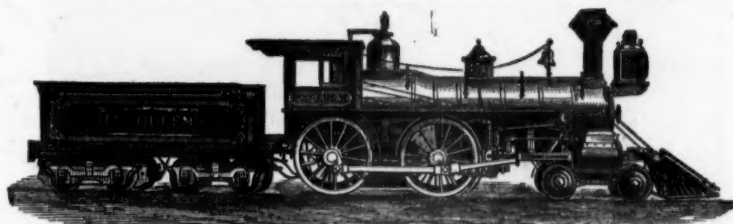
PORTER, BELL & CO., Pittsburgh, Pa.

Exclusive Specialty: Light Locomotives

For Narrow-Gauge Passenger and Freight, Street Railway, Mine, Shifting, and all kinds of Special Service

All work built of best material to thorough system of standard templates
and gauges.
OUR NEW CATALOGUE WILL BE MAILED ON APPLICATION.

SCHENECTADY LOCOMOTIVE WORKS,



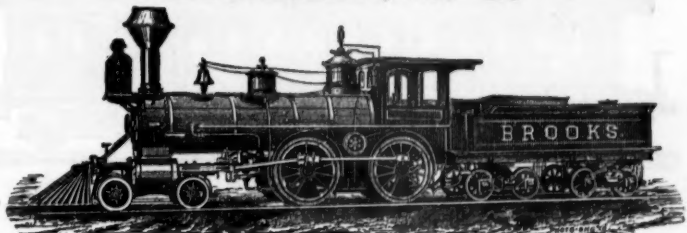
SCHENECTADY, N. Y.

JOHN C. ELLIS, Pres.

OHAS. G. ELLIS, Treas.

JOHN SWIFT, Supt

BROOKS LOCOMOTIVE WORKS, DUNKIRK, N. Y.

Orders Solicited for Locomotives Adapted for Every Class of
Railway Service.

M. L. HINMAN, Sec'y & Treas.

H. G. BROOKS, Pres't & Supt.

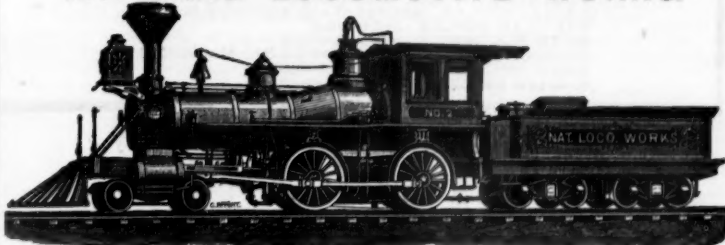
DANFORTH LOCOMOTIVE AND MACHINE CO.

JOHN COOKE, President.
J. T. BLAUVELT, Vice-President.
WM. BERDAN, Sec'y & Treasurer.
JAMES COOKE, Superintendent.

PATERSON, N. J.

New York Office, 52 Wall St
H. A. ALLEN, AGENT.

NATIONAL LOCOMOTIVE WORKS.



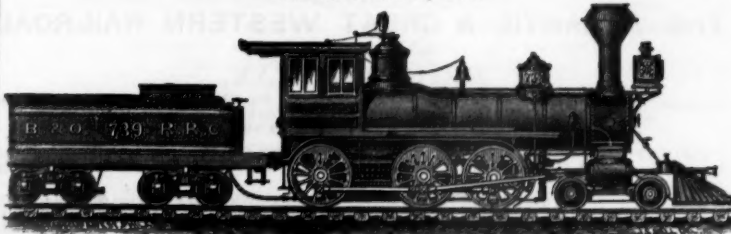
W. H. BAILY & CO.,

MANUFACTURERS OF LOCOMOTIVES. LIGHT and NARROW-GAUGE LOCOMOTIVES A SPECIALTY

All Material and Workmanship Guaranteed to be of the Very Best.

OFFICE AND WORKS AT CONNELLSVILLE, PA.

PITTSBURGH LOCOMOTIVE & CAR WORKS, PITTSBURGH, PA.



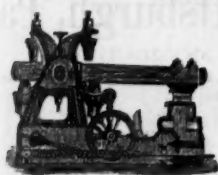
MANUFACTURERS OF

LOCOMOTIVE ENGINES FOR BROAD OR NARROW GAUGE ROADS,
From standard designs, or according to specifications, to suit purchasers.

Tanks, Locomotive or Stationary Boilers Furnished at Short Notice.

D. A. STEWART, Pres't.

WILSON MILLER, Sec. and Treas



BRADLEY'S CUSHIONED HELVE HAMMERS

Has won golden opinions from the Mechanical World during the four years it has been before the public, and has reached a sale of 190 Hammers, all in successful operation, in this and foreign countries.

**It Has More Good Points,
Less Complication,
More Adaptability,
Larger Capacity,
Does More and Better Work,
Takes Less Power,
Costs Less for Repairs
than any Hammer in the World.**

Western Office, 23 South Canal St.,
CHICAGO, ILL.
A. B. BARNES, Manager.

GUARANTEED AS REPRESENTED.

BRADLEY MANUFACTURING CO.,
[Established 1832.] SYRACUSE, N. Y.

J. M. JONES & CO., WEST TROY, N. Y.,



Manufacturers of STREET CARS (Exclusively),
Embracing every variety of Close and Open Cars for either one or two horses.



PASSENGER CARS,

Of the Finest Finish, as well as Every Description of CAR WORK, furnished at Short Notice and at Reasonable Prices by the

HARLAN & HOLLINGSWORTH COMPANY, Wilmington, Del.

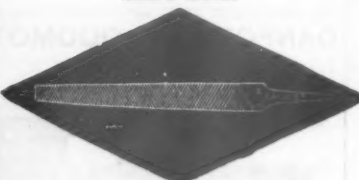
PHILADELPHIA CAR WORKS.



J. G. BRILL & CO.,
Manufacturers of cars of every description. Street
Cars of the most approved styles. Narrow Gauge.
Passenger and Freight Cars.
Thirty-first and Chestnut Streets,
PHILADELPHIA.
Cars built in sections for shipment.

BLACK DIAMOND FILE WORKS

TRADE MARK.



G. & H. BARNETT.
Nos. 39, 41 & 43 Richmond Street,
PHILADELPHIA.
SEND FOR CATALOGUE.

THORNE, DeHAVEN & CO., Drilling Machines,

21st Street, above Market, Philadelphia.

PORTABLE DRILLS. Driven by power in any direction.
RADIAL DRILLS. Self-feed—Large Adjustable Box Table.
VERTICAL DRILLS. Self-feeding.
MULTIPLE DRILLS. 2 to 20 Spindles.
HORIZONTAL BORING AND DRILLING MACHINES.
HAND DRILLS. CAR BOX DRILLS.
SPECIAL DRILLS. For Special Work.

THE ERIE RAILWAY COMPANY.

TO THE TRAVELING PUBLIC.

During the Centennial Season—six months, closing November 10, 1876—the Erie Railway carried almost 3,000,000 passengers, without a single accident to life or limb, or the loss of a piece of baggage.

And for a whole year, the official records of the United States Post Office Department show the arrivals of Erie Railway trains in New York, on time, to be from 15 to 27 per cent. ahead of competing lines.

Facts well worthy the consideration of travelers.

E. S. BOWEN,

General Superintendent.

JNO. N. ABBOTT,

General Passenger Agent.

THE ATLANTIC & GREAT WESTERN RAILROAD,

in connection with the

ERIE RAILWAY.

forms the Great Broad-Gauge Route to the WEST and SOUTH. For Chicago, Cleveland, Omaha and all points in the Northwest. For Cincinnati, Louisville, St. Louis, Kansas City and points in the Southwest.

THIS IS THE ONLY LINE, in connection with the Erie Railway, which runs through sleeping coaches from New York and local stations to Chicago, Cleveland, Mansfield, Galion, Dayton and Cincinnati without change.

Special

The Southern system of railways are now running palace sleeping coaches from Cincinnati (in direct connection with express trains on this line) to Memphis, Jackson and New Orleans; from Cincinnati to Nashville, Decatur, Montgomery, Mobile and New Orleans—making but one change from New York to any prominent point South—via this line.

For through tickets at lowest rates, palace coach locations, and further information concerning the route, please apply at ticket offices Erie Railway and at offices of connecting lines. Ask for tickets via the Atlantic and Great Western Railroad.

P. D. COOPER, Gen. Supt.,
CLEVELAND, O.

W. B. SHATTUC, Gen. Passenger Agent,
CINCINNATI, O.

NEW YORK CENTRAL & HUDSON RIVER R. R.

THE ONLY 4-TRACK RAILROAD IN THE WORLD, ALL LAID WITH HEAVY STEEL RAILS.

This is the favorite route between the East and West, sixty miles the shortest, and eight to twelve hours the quickest between Boston and New England and the West.

Wagner Palace Sleeping and Drawing Room Cars Attached to All Trains.

Through cars New York and Boston to Buffalo, Niagara Falls, Cleveland, Toledo, Detroit, Chicago, Indianapolis, Louisville and St. Louis, &c. No extra charge via Niagara Falls.

New York Ticket Offices—252, 261, 413, 785 and 942 Broadway; 7 Park Place and Grand Central Depot.

C. B. MEEKER,

GENERAL PASSENGER AGENT.

NEW YORK AND NEW ENGLAND RAILROAD.

FOUR POPULAR LINES.

New and popular line between Boston and Philadelphia without change of cars, via N. Y. & N. E. H. P. & F., N. Y. & H. & H. Railroads. Transfer steamer Maryland (between Harlem River and Jersey City). Two express trains, each way, each week day, between Boston and Philadelphia. Most direct route between Boston and Brooklyn.

Elegant drawing-room cars on all trains. Baggage checked through.
A. C. KENDALL, Gen. Pass. Agent. CHAS. P. CLARK, Gen. Manager.

PENNSYLVANIA RAILROAD.

GREAT TRUNK LINE AND UNITED STATES MAIL ROUTE. THE BEST CONSTRUCTED AND MOST COMPLETELY EQUIPPED RAILWAY IN AMERICA.

Connecting all the principal cities on the Atlantic Coast with those in the Mississippi Valley and on the Great Lakes. Through trains with Palace Cars attached, between New York, Philadelphia, Washington and Baltimore and Chicago, St. Louis, Cincinnati and Louisville.

Baggage Checked to Destination. Fare always as low as by any other route.

For tickets, palace and parlor car accommodations, and all desired information, apply at the office of the Company: Nos. 208 and 206 Washington st., Boston; No. 1 Astor House, Nos. 536 and 944 Broadway, and Desbrosses and Cortlandt street ferries, New York; Nos. 838 and 1348 Chestnut street, and Depot, Thirty-second and Market streets, Philadelphia; N. E. cor. Baltimore and Calvert streets, Union Depot and Northern Central Railway Depot, Baltimore; N. E. corner Thirteenth street and Pennsylvania avenue, N. E. corner Sixth street and Pennsylvania avenue, and Baltimore and Potomac R. R. Depot, Washington City.
FRANK THOMSON, General Manager. D. M. BOYD, Jr., General Passenger Agent.

NORTH PENNSYLVANIA RAILROAD.

THE SHORT AND FAVORITE ROUTE FROM PHILADELPHIA

To the Lehigh, Wyoming and Susquehanna Valleys, Scranton, Elmira, Rochester, Buffalo, Niagara Falls, New York State, the West and Northwest.

FAST TIME, SURE CONNECTIONS, PARLOR AND SLEEPING CARS.

Philadelphia Passenger Depot, Berks and American Streets.

FREIGHT FACILITIES:

Daily fast Freight Trains are run between Philadelphia and the above-named districts, delivering freight with regularity and dispatch on terms as low as any other route.

PHILADELPHIA FREIGHT DEPOT, FRONT AND NOBLE STREETS.
ELLIS CLARK, Gen'l Agent, Front and Willow Streets, Philadelphia.
Philadelphia City Offices: Fifth and Chestnut sts. and 733 Chestnut st.

THE BEST ROUTE TO INTERIOR PENNSYLVANIA.

Express Trains daily from Philadelphia to Reading, Harrisburg, Tanawana, Pottsville, Mahanoy City, Ashland, Shamokin, Danville, Williamsport, and all points on the Coal, Lumber and Ore Regions of the State.

EXPRESS TRAINS FROM ALLENTOWN FOR SAME POINTS IN CONNECTION WITH TRAINS OF CENTRAL RAILROAD OF NEW JERSEY FROM NEW YORK.

Purchase Tickets via Reading.

J. E. WOOTTEN,
Gen. Supt., Reading.

C. G. HANCOCK,
Gen. Ticket Agent, Philadelphia.

CLEVELAND, COLUMBUS CINCINNATI & INDIANAPOLIS RAILWAY,

THE GREAT CENTRAL TRUNK ROUTE TO THE OHIO AND MISSISSIPPI RIVERS.

Evening trains leave CLEVELAND daily with Rotunda Sleeping Cars, for COLUMBUS, CINCINNATI, INDIANAPOLIS, LOUISVILLE, TERRE HAUTE, EVANSVILLE, ST. LOUIS and all points West and South.

Morning trains leave daily except Sunday, with through Palace Coaches, for COLUMBUS, CINCINNATI, INDIANAPOLIS, LOUISVILLE and ST. LOUIS without change.

This is the only line making direct connection with all the Principal Trunk Lines of the West at ST. LOUIS.

Direct connection at ST. LOUIS for all Railway Towns in Kansas, Nebraska and Colorado.

EQUIPMENT COMPRISES ALL VALUABLE IMPROVEMENTS.

THE BEST ROAD-BED AND SAFEST ROAD IN THE WEST.

Tickets by this route for sale at all regular ticket offices.

E. S. FLINT,

General Superintendent.

S. F. PIERSON,

General Ticket Agent.

UNION PACIFIC RAILROAD VIA OMAHA.

THE ONLY DIRECT ALL RAIL ROUTE; being 228 miles the Shortest Route.

Salt Lake, Sacramento, San Francisco, and the Mining Districts of Utah, Nevada, California, etc., etc.

Five Hours the Quickest Route to Denver.

Close connections made at Cheyenne with Denver Pacific Railway. At Denver with the Colorado Central. At Golden City with Daily Coaches for the Mines. At Denver with Denver & Rio Grande Railway for all points in Southern Colorado, New Mexico and Arizona.

Baggage checked through from Chicago to Denver, and from Omaha to Salt Lake City, Sacramento, San Francisco, etc.

T. E. SICKELS,

Chief Engineer and Superintendent.

THOS. L. KIMBALL,

General Ticket Agent, Omaha, Neb.

EMPIRE LINE.

THE EMPIRE TRANSPORTATION COMPANY OFFERS TO THE BUSINESS COMMUNITY RELIABLE FAST FREIGHT LINE BETWEEN THE EAST AND THE WEST AND THE GREAT OIL REGION OF PENNSYLVANIA.

Via the Philadelphia & Erie Railroad and its Connections.

IT OWNS AND CONTROLS ALL THE CARS OF ITS LINE, which are new and built expressly for trade, and furnished with BROAD TREAD WHEELS, which enable it to run through irrespective change of gauge, thus avoiding the injurious delays prevalent at transshipping points.

The Line is managed by men of long experience in the business, and no effort will be spared on its part to render satisfaction to its patrons.

Parties ordering goods from the East will please direct shippers to mark packages "EMPIRE LINE" and refer them to the agents of the company for shipping directions, &c., &c.

GEO. W. BISTINE, General Freight Agent, Philadelphia, Pa.

GEORGE M. BALL, Eastern Superintendent, Philadelphia, Pa.

GEO. W. CROSS, Western Superintendent, Cleveland, Ohio.

THE FAVORITE ROUTE—EAST OR WEST.

MICHIGAN CENTRAL RAILROAD,

AN IMPORTANT LINK IN THE

GREAT CENTRAL ROUTE

Between the East and West.

THREE EXPRESS TRAINS EACH WAY DAILY. THE ONLY LINE EAST FROM CHICAGO RUNNING THE CELEBRATED DINING CARS.

WAGNER SLEEPING AND PARLOR CARS.

THROUGH CARS FROM AND TO

CHICAGO, NEW YORK AND BOSTON.

H. B. LEDYARD, Gen'l Sup't, Detroit. HENRY C. WENTWORTH, Gen'l Pass. and Tkt. Agt., Chicago

BALTIMORE & OHIO RAILROAD.

Leave New York from foot of Desbrosses and Cortland streets:

8:40 a. m. for Washington and the West, Richmond, Charleston and the South. Pullman Parlor cars from New York to Baltimore and Washington, making close connection for Cincinnati, St. Louis, Louisville, etc.

1 p. m. for Washington, Pittsburgh, Cincinnati, Chicago, and for Richmond, via Gordonsville. Pullman cars from New York to Baltimore and Washington.

9 p. m. daily for Washington, the South and West. Pullman's sleepers from New York to Baltimore and Washington, making close connections for Chicago, Cincinnati, Louisville, St. Louis, Pittsburgh, the South and Southwest. Connect at Washington with trains for Lynchburg, Florida, New Orleans and the South. For through tickets please call at Company's office, 315 and 1,238 Broadway, New York; and at the ticket offices, foot of Cortland and Desbrosses streets, and Depot, Jersey City.

ASK FOR TICKETS VIA BALTIMORE & OHIO RAILROAD.

PHILADELPHIA, WILMINGTON & BALTIMORE RAILROAD.

The connecting link between the EAST, WEST, NORTH, SOUTH, the centre of the GREAT THROUGH LINE between the cities of NEW YORK, PHILADELPHIA, BALTIMORE and WASHINGTON, the only route between the EAST, WEST and SOUTHWEST, via WASHINGTON, D. C., and the shortest and only direct route between the NORTH and SOUTH.

In every respect a first-class Railway. Tickets via BALTIMORE for sale in all principal ticket offices throughout the country.

H. F. KENNEY, Superintendent. GEO. A. DADMON, General Ticket Agent.

General Offices at Philadelphia, Pa.

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

THE DIRECT ROUTE TO

MILWAUKEE, ST. PAUL AND MINNEAPOLIS,

And all portions of Wisconsin, Minnesota and Northern Iowa.

Purchase Tickets Via Milwaukee.

Passengers going via this NEW DIRECT ROUTE to Milwaukee leave from and arrive at the most Central and best located Depots in Chicago, Milwaukee and St. Paul.

BAGGAGE CHECKED THROUGH BY THIS ROUTE!

Passengers from Chicago can obtain these Advantages only by taking the trains of Chicago, Milwaukee & St. Paul Railway, at Union Depot, corner West Madison and Canal streets.

SPECIAL NOTICE.

This Line connects more important Business Centres than any other route in the Northwest, is as short as the shortest, and is fully equipped with the best of Day and Sleeping Coaches.

A. V. H. CARPENTER, S. S. MERRILL, Gen. Passenger Agent, Milwaukee, Gen. Manager, Milwaukee.

T. E. CHANDLER, Passenger and Ticket Agent, 37 West Madison street, Chicago.

CHICAGO & NORTHWESTERN RAILWAY.

This great corporation now owns and operates over two thousand miles of road radiating from Chicago like the fingers of a man's hand, its lines reach in all directions and cover about all of the country north, northwest and west of Chicago. With one branch it reaches Racine, Kenosha, Milwaukee and the country north thereof; with another line it pushes through Janesville, Watertown, Oshkosh, Fond du Lac, Green Bay, Escanaba to Negaunee and Marquette; with another line it passes through Madison, Troy and for St. Paul and Minneapolis; branching westward from Elroy it runs to and through Wisconsin, Iowa, St. Peter, Mankato, New Ulm, and stops not until Lake Kampeska, Dakota, is reached; another line starts from Chicago and runs through Elgin and Rockford to Freeport, and, via the Illinois Central, reaches Warren, Galena and Dubuque; and the country beyond. Still another line runs almost due westward, and passes through Dixon, Sterling, Fulton, Clinton (Iowa), Cedar Rapids, Marshalltown, Grand Junction, Missouri Valley Junction, to Council Bluffs and Omaha. This last-named is the "Great Trans-Continental Route," and the pioneer overland line for Nebraska, Colorado, Utah, Idaho, Montana, Nevada, California and the Pacific Coast. It runs through the Garden of Illinois and Iowa, and is the best, safest, shortest and quickest route for Omaha, Lincoln and other points in Nebraska, and for Cheyenne, Denver, Salt Lake City, Virginia City, Carson, Sacramento, San Francisco, and all other points west of the Missouri River.

On the arrival of the trains from East or South, the trains of the Chicago & Northwestern Railway leave CHICAGO as follows:

For Council Bluffs, Omaha and California—Two through trains daily, with Pullman Palace Sleeping-Car and Sleeping Cars through to Council Bluffs.

For St. Paul and Minneapolis—Two through trains daily, with Pullman Palace Drawing Room Sleeping Cars attached, for St. Paul and through to Minneapolis.

For Green Bay and Lake Superior—Two trains daily, with Pullman Palace Cars attached.

For Milwaukee—Four through trains daily. Pullman cars on night trains. Pullman parlor chair cars on day trains.

For La Crosse, Wis., Winona and points in Minnesota—One through train daily, with Pullman sleepers to Winona.

For Dubuque via Freeport—Two through trains daily, with Pullman cars on night train.

For Dubuque and La Crosse via Clinton—Two through trains daily, with Pullman cars on night train to McGregor, Iowa.

For Sioux City and Yankton—Two trains daily. Pullman cars to Missouri Valley Junction.

For Lake Geneva—Four trains daily.

For Rockford, Sterling, Kenosha, Janesville and other points you can have from two to ten trains daily.

MARTIN HUGHITT, General Manager. L. F. BOOTH, Gen. Ex. Ag., 415 Broadway, N. Y. city. W. H. STENNETT, General Passenger Agent.

CHICAGO, ROCK ISLAND & PACIFIC RAILROAD.

The direct route for Joliet, Morris, Ottawa, LaSalle, Peru, Henry, Peoria, Lacon, Geneseo, Moline, Muscatine, Washington, Iowa City, Grinnell, Newtown, Des Moines,

COUNCIL BLUFFS AND OMAHA.

Connecting with Trains on the Union Pacific Railroad for CHEYENNE, DENVER, CENTRAL CITY, SALT LAKE, WHITE PINE, HELENA, SACRAMENTO, SAN FRANCISCO, and Points in Upper and Lower California, and with Ocean Steamers at San Francisco, for all ports to China, Japan, Sandwich Islands, Oregon and Alaska.

DEPOT, HEAD OF LA SALLE STREET; TICKET OFFICE, 56 CLARK STREET.

OMAHA AND LEAVENWORTH EXPRESS (Sundays excepted)..... LEAVE 10.15 A. M. ARRIVE 4.00 P. M.

LEAVENWORTH AND OMAHA EXPRESS (Sundays excepted)..... LEAVE 5.00 P. M. ARRIVE 9.35 A. M.

OMAHA AND LEAVENWORTH EXPRESS (Sundays excepted)..... LEAVE 10.00 P. M. ARRIVE 6.00 A. M.

KANSAS LINE.

LEAVENWORTH, ATCHISON AND CHICAGO.

CONNECTING WITH KANSAS RAILROADS,

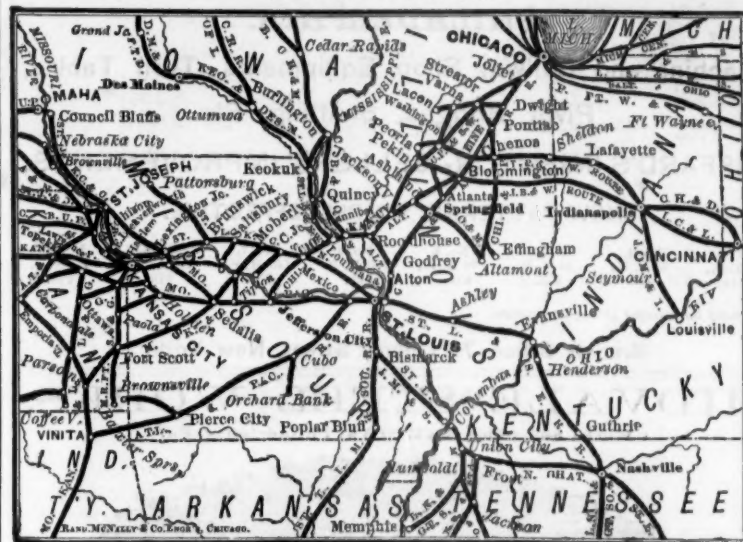
For all points in Western Missouri, Colorado and the Territories.

The Company have built a full complement of PALACE DRAWING ROOM AND SLEEPING CARS, with the most beautiful and interior arrangements for the comfort, convenience and luxury of passengers, and are unequalled, if equaled, by any other cars of the kind in the world.

For Through Tickets and all desired information in regard to Rates, Routes, etc., apply to the Company's Office, Chicago, or 257 Broadway, New York.

HUGH RIDDLE, Gen. Supt. A. M. SMITH, Gen. Pass. Agent.

CHICAGO, ALTON & ST. LOUIS AND CHICAGO, KANSAS CITY & DENVER SHORT LINES.



The Best Line, via St. Louis, to Memphis, Mobile, New Orleans and all points South.

THE SHORT LINE TO TEXAS, VIA ST. LOUIS.

No change of cars on any train by this line between Chicago and St. Louis. Pullman Palace Sleeping Cars—the newest, safest and best in use on any road—run through between Chicago and Springfield and Chicago and St. Louis without change. Meals in Dining Cars only 75 cents. No change of Reclining Chair Cars and Pullman Palace Sleeping Cars between Chicago and Kansas City. No extra charge for seats in Reclining Chair Cars. Two hours the quickest route from Chicago to KANSAS CITY, DENVER, PUEBLO and all points in Kansas and Colorado. No change of cars between Chicago and Peoria.

JAMES CHARLTON, General Passenger and Ticket Agent, Chicago. J. C. McMULLIN, General Superintendent, Chicago.

ILLINOIS CENTRAL RAILROAD.

Trains Leave Chicago from the Great Central Depot, of Lake Street, CHICAGO AND ST. LOUIS THROUGH LINE.

No Change of Cars to St. Louis!

8.40 A. M. DAY EXPRESS. Sundays Excepted. Arriving St. Louis at 8.30 P. M. 8.45 P. M. 8.30 P. M. FAST LINE. DAILY. Arriving at St. Louis at 8.30 A. M.

CAIRO, MEMPHIS, MOBILE AND NEW ORLEANS LINE.

No Change of Cars to New Orleans!

8.40 A. M. DAY EXPRESS. Sundays excepted, arriving at Cairo 2.20 A. M.; Memphis, 5.15 P. M.; Vicksburg, 10.10 A. M.; Mobile, 8.00 A. M.; and New Orleans at 11.45 A. M. 4.30 P. M. GILMAN PASSENGER. Sundays Excepted. Arriving at Gilman at 8.50 P. M.

8.30 P. M. NIGHT EXPRESS. DAILY. Arriving at Cairo 1.45 P. M., making direct connection for Arkansas and Texas. This Route is from 100 to 175 MILES SHORTER and from 12 to 24 HOURS QUICKER than any other.

PEORIA, BURLINGTON AND KEOKUK LINE.

8.40 A. M. EXPRESS. Sundays excepted. Arriving at El Paso 2.30 P. M.; Peoria 3.50 P. M. Through coach from Chicago to Peoria. 8.30 P. M. EXPRESS. Sundays excepted. Arriving at Peoria 3.10 A. M.; Burlington 7.45 A. M. Keokuk 8.15 A. M.; Hannibal 11.30 A. M. Sleeping cars from Chicago to Peoria and Chicago to Hannibal.

CLINTON AND SPRINGFIELD LINE.

8.40 A. M. DAY EXPRESS. Sundays Excepted. Arriving at Gibson 1.57 P. M.; Farmer City 2.57 P. M.; Clinton 3.48 P. M.; Springfield at 6.05 P. M. 8.30 P. M. NIGHT EXPRESS. Sundays excepted. Arriving at Gibson 12.30 A. M.; Farmer City 1.55 A. M.; Clinton, 2.38 A. M.; Springfield, 4.35 A. M.

DUBUQUE AND SIOUX CITY LINE.

9.30 A. M. DAY EXPRESS. Sundays Excepted. Arriving at Dubuque 7.00 P. M.; Waterloo, 12.05 P. M.; Clinton 3.48 P. M.; Springfield at 6.05 P. M. 9.30 P. M. NIGHT EXPRESS. Sundays Excepted. Arriving at Dubuque 6.55 A. M.; Waterloo 12.05 P. M.; Fort Dodge, 7.00 P. M.; Sioux City, 7.10 A. M.

This is the only Route to Dubuque and Sioux City without Change. For Tickets, Sleeping Car Berths and information, apply at the Illinois Central Railroad Ticket Office, 121 Randolph street, near Clark, and at the Central Depot, foot of Lake street.

W. P. JOHNSON, Gen. Pass. Agt. J. F. TUCKER, Gen. Supt.

ILLINOIS CENTRAL FREIGHT DEPARTMENT.

Freight taken for St. Louis, and points West and Southwest. For Hannibal and all points on the M. & T. R. R. For all landings on the Mississippi, Red and White Rivers, via Cairo and regular packets. THE ONLY RAIL LINE TO MEMPHIS AND NEW ORLEANS, with

CARS RUN THROUGH WITHOUT CHANGE,

via the N. O., St. L. & C. R. R., and by its connection at Frost, Tenn., the Direct Route to all points reached by the Green Line of the South; to Mobile, and points on the M. & O. R., via Jackson, Tenn., to Dixon, Freeport, Warren, Galena, Dunleith, and all landings on the Upper Mississippi during season of navigation, and without change of cars to Dubuque, Waterloo, Fort Dodge and Sioux City, Iowa; Vermillion and Yankton, Dakota Territory; and via Missouri Packets to points on the Upper Missouri. Bills Lading and Rates furnished upon application at 121 RANDOLPH street, or foot of South Water street.

HORACE TUCKER, General Freight Agent.

WISCONSIN CENTRAL RAILROAD.

GARDNER COLBY, Pres., Boston, Mass. E. H. ABBOTT, Treas., Boston,

Built and operated by Phillips & Colby Construction Company. E. B. Phillips, Pres. and Gen. Manager Milwaukee; Charles L. Colby, Vice-Pres. and Land Commissioner, Milwaukee; E. Bacon, Superintendent, Milwaukee; Henry Pratt, Auditor and Gen. Ticket Agent, Milwaukee.

OFFICES: Milwaukee, Wis., and 28 State Street, Boston, Mass.

SHORT LINE TO GREEN BAY, the WISCONSIN and CHIPPEWA PINERIES, ASHLAND and BAYFIELD, LAKE SUPERIOR, Via MENASHA and STEVENS POINT.

TWO DAILY TRAINS FROM MILWAUKEE FOR MENASHA AND GREEN BAY. ONE TRAIN FOR STEVENS POINT, WAUPACA, AMHERST, GRAND RAPIDS, PLOVER, PLAIN FIELD, COLBY, MEDFORD, PHILLIPS, FIFIELD AND ASHLAND.

Through Sleeping Cars on 9:30 p. m. train from Chicago (C., M. & St. Paul Depot), and from Milwaukee on 1:30 a. m. train for Green Bay, Menasha and Stevens Point. Sleeping car at Milwaukee ready at 8:30 p. m.

ELEGANT NEW CARS HAVE BEEN ADDED.

Price of berth only \$1.50.

CONNECTIONS: At Milwaukee, with Chicago, Milwaukee & St. Paul, and Western Union Railways; at Plymouth, with Sheboygan & Fond du Lac Railroad, for Fond du Lac and Sheboygan; at Forest Junction, with Milwaukee, Lake Shore & Western Railway; at Green Bay, with Green Bay & Minnesota Railway, for New London, and Chicago & Northwestern Railway, for points North; at Dale, with fast stage line for New London; at Amherst Junction, with Green Bay & Minnesota Railway, for Grand Rapids and points West; at Junction City, with Wisconsin Valley Railway, for Wausau; at Portage with C., Mil. & St. Paul Ry., for Madison and the West.

ESTABLISHED 1848.

WILLIAM SELLERS & CO.

PHILADELPHIA.

Machine and Railway Shop Equipments, Turn Tables,
Pivot Bridges, Shafting, Etc.

GIFFARD'S INJECTOR—SELLERS' IMPROVEMENTS.

NEW PATTERNS, SIMPLE, EFFECTIVE.

No. 2, 10 H. P., \$18.	No. 3, 25 H. P., \$28.	No. 4, 45 H. P., \$38.	No. 5, 70 H. P., \$48.	No. 6, 100 H. P., \$58.	No. 7, 140 H. P., \$68.	No. 8, 190 H. P., \$78.	No. 10, 275 H. P., \$98.
------------------------------	------------------------------	------------------------------	------------------------------	-------------------------------	-------------------------------	-------------------------------	--------------------------------

Send for circular giving particulars.

Branch Office, 79 Liberty Street, New York.

MIDVALE STEEL WORKS.

Works and Office, NICETOWN, Philadelphia, Pa.

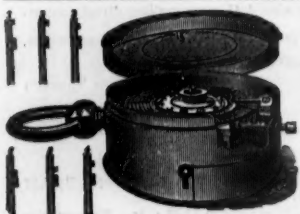


MANUFACTURERS OF

Crucible and Open Hearth Steel,

Steel Locomotive Tires, Steel Axes of Every Description, Steel Forgings, up
to 8,000 lbs. in Weight, Solid Steel Castings, Hammer Dies,
Frogs, &c. Best Tool, Machinery and Spring Steels.

WM. SELLERS, Pres. MARRIOTT C. SMYTH, Sec'y and Treas. CHAS. A. BRINLEY, Sup't.

BUERK'S
Watchman's Time
DETECTOR.Important for all Large Corporations
and Manufacturing Concerns.Capable of controlling with the utmost accuracy the motion of a watchman or patrolman as the
same reaches different stations of his beat. The instrument is complete in itself, portable and as reliable
as the best lever watch. It requires no fixture or wires communicating from room to room, as is the
case with the ordinary watch clocks. A small, inexpensive stationary key is alone required at each
station. The instrument will, in all cases, be warranted perfect and satisfactory.N. B.—The suit against Imhaeuser & Co., of New York, was decided in my favor, June 10, 1874.
Another suit has been decided against them and a fine assessed Nov. 11, 1876, for selling contrary to the
order of the Court. Persons using clocks infringing on my Patent, will be dealt with according to law.

J. E. BUERK, Proprietor,

P. O. Box 979.

No. 230 Washington Street, Boston.

In sending for circular or ordering the above, please mention this paper.

DILWORTH, PORTER & CO.,
RAILROAD
SPIKES AND FASTENINGS,
PITTSBURGH.

PATENT METALLIC SHEDS AND WAREHOUSES.

These Sheds are
LIGHT, STRONG,

AND

ELASTIC,

therefore especially well
adapted to

RESIST VIBRATIONS

From Machinery
and the pressure of heavy
winds.They can be taken apart and
put up again in a very short
time by any intelligent la-
borer, and also take little
room for shipping by cars or
steamers; they are conse-
quently

PORTABLE

in the fullest sense of the
word, being built entirely of

SCHWEIZER & GRUWE, 71 BROADWAY, N. Y.

GILES BRO. & CO.,

266 & 268 Wabash Avenue,
CHICAGO, ILL.

FINE WATCHES A SPECIALTY.

Railroad Time-Keepers, One-Fourth Seconds, Sporting Watches, Repeaters, &c.
AGENTS FOR JURGENSEN, HOWARD & ELGIN WATCHES.GEO. J. BURKHARDT & CO.,
Cedar Tank Factory,
No. 1,341 Buttonwood St., Philadelphia.Tanks and Reservoirs from 150 to 150,000 gallons,
for Railroads, Rolling Mills, Factories, Private and
Public Buildings.

SEAMLESS STEEL WARE & FROG CO.,

HARRISBURG, PA.

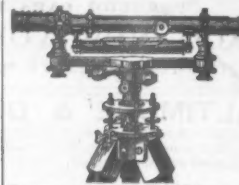
Frogs,
Switches,
Crossings,
Steel Barrows,
Other R. R. Supplies.

Descriptive circulars sent upon application.

C. H. JACKSON, Manager.

ZELL'S
ENCYCLOPEDIA.
NEW REVISED EDITION.
AGENTS WANTED.150,000 articles, 3,000
engravings and 18 splen-
did maps. The BEST BOOK
of universal knowledge in
the language. Now in
course of publication.
SPECIMEN with map sent
for 20 cents.By addressing the pub-
lishers, canvassers will
learn of a new plan by which the work is selling
rapidly.T. Ellwood Zell, Davis & Co., Phila.
B. W. BOND, 5 Beckman st., New York

TRADE MARK, PATENTED.

PRINCE'S METALLIC PAINT,
AN INDESTRUCTIBLE COATING FOR
IRON, TIN, OR WOOD.For Sale by the Trade and
PRINCE'S METALLIC PAINT CO.,
Manufacturers,
225 Pearl Street, New York.
Caution.—As certain parties are offering for sale
a SPURIOUS PAINT, under an imitation name,
purchasers will please see that our TRADE MARK
is on every package. None other genuine.W. KUEBLER,
Engineering
Instrument
MANUFACTURER,
No. 925 Sanson St.,
Philadelphia.
Teal the attention
of Engineers to my
Patented Improve-
ment on Telescopes
and Patented Uni-
versal Theodolite.

BUFF & BERGER'S

Large Illustrated Catalogue and Manual of Im-
proved ENGINEERS' and SURVEYORS' FIELD IN-
STRUMENTS, of their manufacture, is now ready
and will be sent, Post-paid, on receipt of 25 cents.
Price List free, on application. BUFF & BERGER,
Manufacturers of Engineers' and Surveyors' Instru-
ments, No. 2 Province Court, Boston, Mass.HELLER & BRIGHTLY, Engineering and
Surveying Instruments, 33 N. Seventh St., Phila.Without decreasing size of any
part of our "Engineers' Transit"
we have reduced the weight one-
half. An ordinary Transit Tele-
scope magnifies from 10 to 12 di-
ameters, our new Transit Telescope
(length 10 1/2 inches, shows objects
erect and not inverted) magnifies
25 diameters and will read time on
a watch-dial at 983 feet. For de-
scription of our new Mining Transit
(weight 6 1/2 lbs.) and Plummet
Lamp, see Van Nostrand's Engi-
neering Magazine, June, 1873.Extract from report of Committee
of Civ. Engs. appointed by Frank-
lin Inst. to examine H. & B.'s new
Transit (Dec., 1871): "It exhibits
several novelties of construction
which, in the opinion of the committee, render it su-
perior to those now in use, and in its opinion the deviations
which they have made from the common styles of Transit
are decided improvements."Descriptive and Illustrated Price List sent Post-paid on
Application.

Engineers' and Surveyors' Instruments.

MEDAL AWARDED—Exhibition
of All Nations, New York, 1853,
for best Drawing Instruments.
Particular mention for Limb Pro-
tractors.MEDAL AWARDED—International
Exhibition, Philadelphia, 1876,
for Surveying and Leveling In-
struments.JAMES PRENTICE,
164 Broadway, N. Y.

ESTABLISHED 1820.

PATENT TRANSITS.

W. J. YOUNG & SONS,

Engineering Instrument Makers,



43 NORTH SEVENTH STREET,

Philadelphia.

Tapes, Chains, Draughting In-
struments. Catalogues on application.

VALENTINE & COMPANY,



323 PEARL STREET, NEW YORK.

BOILER PUNCHES.

I. P. RICHARDS'
STANDARD PUNCHES,
PROVIDENCE, R. I.

A SPECIALTY.

Price List with Cuts furnished on application. Non-Combustible

Material.

they can not be ignited by
sparks from locomotive
steamers, or neighboring
fires, and in view of this fact
they are very

ECONOMICAL.

as the small expense of the
cost over a wooden structure
is fully compensated by the

REDUCTION

IN THE

INSURANCE RATES

and the greater safety of the
property stored.

Manufactured by